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Effectiveness of Pictorial Health Warning Labels for Indonesia's Cigarette Packages

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EFFECTIVENESS OF PICTORIAL HEALTH WARNING LABELS FOR INDONESIA'S CIGARETTE PACKAGES

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DEDICATION

To the loving memory of my parents, Adnan and Dimrona, who passed away before ever read this work. Your love will always light my way.

To my guardian angel, Ringking, and my little angels, Rosabelle and Michael, who have been my constant source of support, encouragement and excitement during this challenging graduate life.

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ABSTRACT

Pictorial health warning labels (PHWL) on cigarette packaging is a key way to communicate with consumers about the harms from tobacco, particularly in the low- and middle-income countries that do not have the resources for effective mass media campaigns. Research is needed to determine the most effective PHWL content for Indonesia, a country with one of the largest populations of smokers in the world and amongst the weakest tobacco policy environments. This research aimed to determine the most effective PHWL content for Indonesia's cigarette packages, including the social and psychological factors that may influence PHWL effects.

Data for this study came from a field experiment with Indonesian adult smokers (n=584), and 15- to 18-year-old adolescent smokers (n=280) and nonsmokers (n=313) using both between- and within-subject manipulations. First, we assessed effects of health warning label (HWL) characteristics, including warning type (text-only versus pictorial warnings = within subject), imagery type (graphic, suffering, and symbolic imagery = within subject), and textual type (didactic versus testimonial = between subject), on negative emotional responses, message credibility, and perceived effectiveness of the HWLs. Second, we assessed whether the effects of HWLs on these outcomes were moderated by variables for which theories indicated differential responses to HWLs were likely (i.e., smoker identity and self-efficacy to quit among smokers, reactance to HWL stimuli and advertising exposure among all participants). Main and interactive effects of HWL manipulations and participant characteristics on outcomes

were estimated using linear mixed effects models to adjust for correlated data due to repeated measures.

We found that compared to text-only warnings, PHWLs were rated significantly higher on all outcomes. Within the PHWLs, those with graphic imagery were rated the highest on all outcomes, followed by suffering imagery, and symbolic imagery. No significant differences were found between textual types for any outcome. Smoker identity was negatively associated only with perceived effectiveness, with no significant interactions found. Self-efficacy was positively associated with all outcomes, finding a significant interaction with imagery type in models for negative emotions, suggesting that rating differences between text-only HWLs and symbolic PHWLs were greater amongst those with higher self-efficacy. Reactance was positively associated with all outcomes, significantly interacting with imagery type in models assessing negative emotions and perceived effectiveness. This suggests the differences between symbolic and suffering PHWLs were greater amongst those with low reactance than those with high reactance, although the pattern of results with regard to which HWL image styles had the strongest effects was the same. Advertising exposure was positively associated with all outcomes and significantly interacting with textual and imagery types when assessing message credibility and perceived effectiveness. This suggests that didactic HWLs were rated lower than testimonials in low exposure group but were rated higher in high exposure group, while differences between graphic and suffering PHWLs were greater in low exposure than in high exposure groups.

Overall, specific types of HWL content produced a pattern of responses for Indonesia that is similar to other countries. Our findings add further support for FCTC

recommendations to adopt graphic PHWLs, with no evidence found to suggest the negative effects for PHWLs in key subpopulations.

PREFACE

This dissertation outlines the epidemic of tobacco use in Indonesia as its underlying problem for the research. This dissertation also adds scientific evidences around the effectiveness of pictorial health warning label (PHWL) in the developing countries, and around characteristics of PHWLs that is most likely to be effective across subgroups of population. The method section of this dissertation provides details to conduct field experimental research as a cost-effective way to collect data targeted population. The chapter four of this dissertation lay outs two unpublished manuscripts as the result of the study, while chapter five provides summary and conclusion, along with practical and scientific implications, and suggestion for future research.

This dissertation should be of interest for decision makers, specifically in the Ministry of Health Republic of Indonesia, as well as for tobacco control advocates and researchers. It should also be of interest to scholars of public health, health communication, and health psychology.

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LIST OF ABBREVIATIONS

FCTC ..... Framework Convention on Tobacco Control

GATS ..... Global Adult Tobacco Survey

GYTS .....Global Youth Tobacco Survey

HIC.....High-income countries

HWL .....Health warning label

LMIC..... Low- and middle-income countries

MIC ..... Middle-income countries

MoH-RI..... Ministry of Health Republic of Indonesia

PHWL ..... Pictorial health warning label

PP ..... *Peraturan Pemerintah* (Government Regulation)

SES..... Socio-economic status

UU .....*Undang-Undang* (Law)

WHO .....World Health Organization

CHAPTER 1

INTRODUCTION

Tobacco use killed almost six million people in 2011, and nearly 80% of these deaths occurred in low and middle-income countries (Eriksen, Mackay, & Ross, 2012). Globally, tobacco use also accounts for 12% of all deaths among adults (aged 30 years and above), making it the second major cause of mortality in the world (World Health Organization, 2012b). In Indonesia, the proportion of deaths attributable to tobacco use is even higher: 16% of all deaths among adults aged 30 years and above (World Health Organization, 2012b). Indonesia has the fourth largest population in the world and is classified as a lower-middle income economy (i.e., countries with gross national income per capita in between US$1,046 and US$4,125; World Bank, 2014). Despite its lower-middle income status, Indonesia is currently among the top four cigarette consuming countries after China, Russia, and the United States, with total consumption increasing from 182 billion cigarettes in 2001 to nearly 240 billion in 2014 (Eriksen, Mackay, Schluger, Islami, & Drope, 2015). The estimated direct cost of tobacco use in Indonesia is about US$13.9 billion (Eriksen, Mackay & Ross, 2012) while the total tax revenue from all tobacco products is about US$ 6.5 billion (World Health Organization, 2012a).

In June 2003, the World Health Organization introduced the Framework Convention on Tobacco Control (WHO-FCTC), the world's first international public health treaty, which obligated ratifying countries to employ a variety of demand- and

supply-reduction strategies in response to the global tobacco epidemic (World Health Organization, 2005). Up to March 2015, 180 countries have ratified the WHO-FCTC, while Indonesia has neither signed nor ratified it. This apparent lack of political will around tobacco issues helps explain why Indonesia has lagged behind its neighbors in combating the tobacco epidemic. Thailand, for example, has successfully reduced smoking prevalence among men from 60% in 1991 to 45.6% in 2011 through the implementation of strong measures recommended by the WHO-FCTC, including tax increases, marketing bans, smoke free zones, and graphic pictorial warnings on tobacco packaging (Murdoch, 2012).

Pictorial health warning label (PHWL) is one of the six key measures promoted by the WHO-FCTC to assist in reducing the demand for tobacco products (World Health Organization, 2005). To date, over 100 countries have adopted this recommendation (Canadian Cancer Society, 2016). Despite its reluctance to ratify the WHO-FCTC, in late 2012, the Indonesian government authorized a new government regulation on PHWLs. Under this regulation, PHWLs should include pictorial and textual messages on the health-related effects of smoking and cover 40% of the front and 40% of the back of cigarette packages (*Pengamanan Bahan Adiktif*, 2012), which is in accordance with guidelines for Article 11 of the WHO-FCTC.

Theories suggest that text with picture may be more persuasive than text alone (Chaiken, 1980; Petty & Cacioppo, 1986; Slovic, Finucane, Peters, & MacGregor, 2007; Strahan et al., 2002) and ample of evidence have been provided from the field of health communication (Chang, 2013; Houts, Doak, Doak, & Loscalzo, 2006). In warning label literatures, studies in high-income countries (HICs) have shown that PHWLs increase

knowledge about the risks of smoking (Evans et al., 2015; Hammond, Fong, McNeill, Borland, & Cummings, 2006; Swayampakala et al., 2015) while also promoting other psychological and behavioral responses that are related to smoking cessation, such as negative emotional reactions (e.g., Hammond, Fong, McDonald, Brown, & Cameron, 2004; Nonnemaker, Choiniere, Farrelly, Kamyab, & Davis, 2015), credibility of the message (e.g., Cantrell et al., 2013; Peters et al., 2007), thinking about quitting (e.g., Hammond et al., 2007; Thrasher et al., 2012), and quit intention as well as quit attempt (e.g., Brewer et al., 2016). Nevertheless, further research is still needed to explore the potential impact of different executional styles for warning content (e.g., the use of brief testimonial messages, non-health consequences of tobacco use, etc.), as well as to explore social and psychological factors that might moderate the impact of warning content. Furthermore, although studies in different cultural contexts, such as in Mexico (e.g., Thrasher, Hammond, Fong, & Arillo-Santillán, 2007) and Malaysia (Fathelrahman et al., 2010), have shown that smokers respond to warnings in ways that are similar with those from high-income countries, research is still needed to determine the impacts of PHWLs in low- and middle-income countries (LMICs), particularly countries like Indonesia, where other tobacco control policies are relatively weak. Findings from this study aim not only to provide evidence on the most effective PHWL content, but also to inform the Ministry of Health Republic of Indonesia (MoH-RI) selection of content for the second round PHWLs in Indonesia.

Objective

The objective of this study is to determine the most effective PHWL content for Indonesia, including similarities and differences with research from other countries, as

well as to assess social and psychological factors that may moderate PHWL impacts. Findings from this study aim to inform the Indonesian Ministry of Health's selection of content for the second round of PHWLs, while adding to scientific evidence on the most effective PHWL content.

To meet the objective, we manipulated the imagery and the textual types of the study stimuli. The imagery used in this study was classified based on the fear appeal theory (Witte, 1992) from the most frightening (PHWLs with graphic imagery), moderately frightening (PHWLs with suffering imagery), less frightening (PHWLs with symbolic imagery) and the least frightening (HWLs with no image). Evidences suggest that warnings with images that strongly arouse negative emotion (e.g., open heart surgery) were perceived as more effective (Humphris & Williams, 2014) and were more likely to induce cessation behavior (Hammond et al., 2004) than those with low negative emotional arousal (e.g., a bended cigarette symbolizing impotence). For the textual type, we used short version of testimonials, assessing its relative effectiveness compared to more common didactic texts (i.e., presenting factual arguments about cause and effect). For the assessment of outcomes, we used warning reactions (i.e., negative emotional responses and message credibility) and perceived effectiveness that has been considered as measures for immediate outcomes in the message impact framework for the cigarette pack warning (Noar, Hall, et al., 2016). We laid out two specific aims for this study: 1) To assess which different image types and textual strategies for PHWLs are most likely to reduce tobacco use among Indonesian adult smokers and adolescents; 2) To assess main and moderating effects of social and psychological factors (i.e., smoker identity, advertising exposure, self-efficacy, and reactance) on these three outcomes.

Preview

This presentation consists of five chapters. The first chapter outlines the problem, provides a problem statement, and justifies the research. The second chapter discusses the background and significance of the study, providing a fuller treatment of the scientific literature reviews, specific aims, and hypotheses. The third chapter describes the methodology, while the fourth chapter presents study results in the form of two manuscripts prepared for submission to scientific journals. The final chapter summarizes the findings and their implications, and points out recommendations for future research.

CHAPTER 2

BACKGROUND AND SIGNIFICANCE

In this chapter, I will provide a brief history of tobacco use and warning label regulations in Indonesia as background for this study. After that, I will review scientific studies of PHWL characteristics and variables used in this study, followed by a summary statement of the research problem. At the end of this chapter, I will outline specific hypotheses that will be tested and describe the conceptual model that orients this study.

Tobacco Use in Indonesia: From Betel Quid to Clove Cigarettes

Long before Indonesians started smoking cigarettes, betel chewing was popular for its relaxant, analgesic, and social benefits (e.g. to entertain guests as with tea in British culture). Tobacco was first brought by the Dutch expedition to the Indonesian island of Java in the early 17th century (A. Reid, 1985). The Dutch pipe smoking habits were then imitated by the local elites in Java. *Merokok*, the Indonesian term for smoking was actually adapted from the Dutch verb "to smoke", *roken* (Achadi, Soerojo, & Barber, 2005). Not only was smoking introduced during Dutch colonization, but so were tobacco plantations. The growing of tobacco spread quickly on the islands of Java and Sumatra, and with this spread, tobacco use came within reach of almost all Indonesians, gradually replacing the thousand-year-old rituals of betel chewing in the Indonesian archipelago (Reid, 1985).

Betel chewing was not solely of Indonesian heritage, but was practiced widely across Southeast Asia. However, unlike the Southeast Asians who commonly used three

key ingredients (i.e. areca, betel, and lime) for betel chewing, Indonesians have the longstanding habit of adding spices and aromatics, and the most frequently used additives were camphor, cloves, nutmeg, ambergris, cardamom, and musk (A. Reid, 1985). By the end of 18th century, however, two additions had become standard in betel chewing in Indonesia: extract of *uncaria gambir* and tobacco. When Indonesians started to roll their own cigarettes in late 19th century, they followed the practice of adding spices and aromatics, and clove was among the most popular flavors, whose combination with tobacco resulted in the unique Indonesian *kretek* cigarettes (Achadi et al., 2005). Nowadays, around 80% of Indonesian smokers only smoke clove cigarettes and about half of clove cigarette smokers only smoke non-filtered varieties (Achadi, Kosen, Soerojo, & Barber, 2004). Clove, or *kretek* cigarettes are comprised of 30%-40% of dried clove buds, which contain eugenol, commonly used as local anesthetic in dentistry (Achadi et al., 2005). Because of its anesthetic effect, eugenol in *kreteks* decreases the harshness of tobacco smoke, which allows for slower, yet deeper inhalation (Hurt, Ebbert, Achadi, & Croghan, 2012). Indonesian *kreteks* also yield more nicotine than cigarettes sold in the U.S., which some suggest has made *kreteks* more addictive than the non-clove and filtered cigarettes (Achadi et al., 2005; Hurt et al., 2012).

Similar to other Southeast Asian countries, smoking in Indonesia is more common for males than females, with 56.7% vs 1.9% adult smokers age 16 and over, respectively, and 36.2% vs 4.3% for youth age 13-15, respectively (World Health Organization, 2015). The low prevalence of smoking among Indonesian females is commonly attributed to cultural values that stigmatize female smokers (Barraclough, 1999). In contrast with trends from other parts of the world, the prevalence of smoking among Indonesian who

are older than 15 has been increasing, from 26.9% in 1995 (Achadi et al., 2005) to 33.2% in 2013 (World Health Organization, 2015). Among youth aged 13 to 15 years old, smoking prevalence has also been increasing, going from 12.6% in 2006 (Aditama, 2008) to 20.3% in 2014 (World Health Organization, 2015).

Cigarette Warning Label Regulations in Indonesia

Cigarette consumption in Indonesia increased rapidly after their manufacture was transformed in the 1970s with the mechanization of clove cigarette production, making their producers big industries in Indonesia (Achadi et al., 2005; A. Reid, 1985). The major tobacco companies (e.g. Gudang Garam, Djarum, and Sampoerna) are among the 10 biggest taxpayers and have strong political linkages, which were particularly notable during Suharto's authoritarian regime from 1967 to 1998 (Lawrence & Collin, 2004; Multinational Monitor, 2005). This likely accounts for why tobacco control was not on public health policy agenda until late 1990s (Reynolds, 1999).

Only after the fall of Suharto regime in 1998 did Indonesia have its first government regulation on tobacco, which was signed by Suharto's successor, President Habibie in 1999 (Achadi et al., 2005). This regulation authorized the first health warnings on cigarette packages, using one health message (i.e., "Smoking can cause cancer, heart attacks, impotence and harm pregnancy and fetal development") and specifying that tar and nicotine levels be printed on cigarette packages (Government of Indonesia, 1999). In the following year, Habibie's successor President Wahid signed an amendment including the adoption of five additional health warnings (Government of Indonesia, 2000). However, in 2003, Wahid's successor President Megawati signed an amendment that authorized only one health warning be displayed on cigarette packages, and the size of

health warning was specified at 15% of the package (Government of Indonesia, 2003). These repeated changes likely reflect how governmental policy protects and promotes the tobacco industry (Hurt et al., 2012). Research on formerly secret internal tobacco industry documents has also provided evidence of tactics that the tobacco industry used to resist government regulation of its products, including funding political parties and preventing strong legislation by pressing for the adoption of weaker laws (Saloojee & Dagli, 2000).

In 2009, after years of political battle between public health activists and the tobacco industry in Indonesia, the House of Representatives passed a new health law that classifies tobacco as an addictive substance and allows stronger measures to reduce tobacco use, including the implementation of PHWLs and banning the use of misleading descriptive terms (e.g. mild, light, low tar, etc.) that accompany cigarette brand names (see Table 2.1 for comparison of the changes in health warning regulation in Indonesia since 1999). Still, it took more than three years for the government to approve the regulations and for the law to be implemented and enforced. In late December 2012, the then President Yudhoyono finally signed a new tobacco control regulation. Under the new regulation, tobacco companies are obligated to print PHWLs on 40% of the front and the back of cigarette packs. The new regulation specified that the first round of PHWLs should appear 18 months after the regulation was signed, or by June 24th, 2014, and these PHWLs would be printed for at least two years (Government of Indonesia, 2012). The first round of PHWLs includes five different PHWLs, all of which were used originally in Thailand (see Figure 2.1). The MoH-RI is empowered to propose the next round of PHWLs, which is scheduled for implementation on June 2017.

Table 2.1. Government regulations on cigarette warning label in Indonesia since 1999

Regulation / PP*	PP No. 81	PP No. 38	PP No. 19	PP No. 109
Regulation Year	1999	2000	2003	2012
Governing Law / UU (Year)**	UU No. 23 (1992)	UU No. 23 (1992)	UU No. 23 (1992)	UU No. 36 (2009)
Accessibility	Health warnings must be easy to read.	Health warnings must be easy to read.	Health warnings must be placed on and comprise at least 15% of the side of the package.	Health warnings must be placed on top and use 40% of the front, 40% of the back of the pack, 15% of the side of the package.
Message	The one authorized health warning reads: "Smoking can cause cancer, heart attacks, impotence and harm pregnancy and fetal development."	The MoH and Coordinating Ministry for Social Welfare authorized five alternative text warnings.	The one and only authorized health warning reads: "Smoking can cause cancer, heart attacks, impotence and harm pregnancy and fetal development."	Five pictorial and textual warnings for every two-year starting on June 24th, 2014.
Tar and nicotine disclosure	Tar and nicotine levels must be disclosed on cigarette package.	Tar and nicotine levels must be disclosed on cigarette package.	Tar and nicotine levels must be disclosed on cigarette package.	Tar and nicotine levels must be disclosed on cigarette package.

* UU stands for *Undang-Undang*, or Law.

** PP stands for *Peraturan Pemerintah*, or Government Regulation.

Warning: Smoking kills.	Warning: Smoking causes lung cancer and chronic bronchitis.	Warning: Smoking causes mouth cancer.	Warning: Smoking near children is harmful.	Warning: Smoking causes throat cancer.

Figure 2.1. Adapted Thailand images for the first round of PHWL in Indonesia (Source: Peraturan Menteri Kesehatan No. 28, 2013)

Pictorial Health Warning Label (PHWL) Effects

Studies of warning labels on cigarette packaging highlight how packaging is an important medium for communicating with smokers. Given that people have a fundamental right to information about the harms of tobacco use, health warnings on cigarette packages provide needed information about the dangers of smoking (Eriksen et al., 2012). In its report on the global tobacco epidemic, the World Health Organization (WHO) noted that many smokers still do not fully understand the magnitude or range of risks that smoking causes to their own health or the health of others, despite clear evidence about the dangers of smoking (World Health Organization, 2011). Fortunately, during the last decade, research on PHWLs has grown substantially as the number of countries/jurisdictions requiring PHWLs on cigarette packages has increased from only one in 2001, when Canada first introduced this policy, to over 100 countries in 2016 (Canadian Cancer Society, 2016).

Measures to Evaluate the Effectiveness of PHWLs

Measures to evaluate the effects of PHWLs vary depending on the study objective and design. Observational studies can assess longer term impacts of implemented warning regulation such as changes in knowledge, beliefs, attitude, intention and behavior (Fong et al., 2006; Noar, Francis, et al., 2016). However, isolating the effects of different warning characteristics in such studies will be difficult. On the other hand, experimental studies can assess the relative impacts of different message characteristics measuring only immediate outcomes, such as negative emotional responses, message credibility, and perceived effectiveness.

Emotional appraisal is critical because it can be associated with particular action tendencies that are automatic and impulsive (Slovic et al., 2007; Turner, Skubisz, & Rimal, 2011). Theory suggests that negative emotion such as fear can positively affect the perceived severity of a threat (Witte, 1992) and measure of negative emotion can be used to predict the persuasiveness of health messages (Dillard & Anderson, 2004). Message credibility is one of cognitive evaluations that can increase message acceptance, shift attitude, thus can lead to behavior change (Petty & Briñol, 2015; Petty & Cacioppo, 1986). Measure of message credibility can also be used to assess the relative believability of different warning characteristics among targeted audiences (IARC, 2008).

Another immediate outcome that has been commonly used in formative work is perceived effectiveness. Measure of perceived effectiveness can be used to assess the persuasive outcome of message characteristics (Dillard, Weber, & Vail, 2007; Dillard & Ye, 2008; Yzer, LoRusso, & Nagler, 2015). In a study assessing the effectiveness of two anti-smoking campaigns, measures of perceived effectiveness were found to positively

correlated with changes in both quit intention and quit attempts (Brennan, Durkin, Wakefield, & Kashima, 2014). These three measures have also been considered as immediate outcomes in a message impact framework that guided a review that meta-analyzed results from 37 experimental studies on PHWLs (Noar, Hall, et al., 2016). This framework was built on psychological and communication theory (Fishbein & Ajzen, 2009; McGuire, 2013; Petty & Cacioppo, 1986; Witte, 1992) as well as previous tobacco warning theory and research (Fong et al., 2006; IARC, 2008; Strahan et al., 2002).

Pictorial vs Text-only Warnings

Dual process theories, such as the heuristic-systematic model (HSM) of information processing (Chaiken, 1980), the elaboration likelihood model (ELM) of persuasion (Petty & Cacioppo, 1986), and the affect heuristic (Slovic et al., 2007), suggest that text with picture may be more persuasive than text alone, particularly because the former require minimal cognitive effort to process than the latter. Research in health communication area has also found that health messages with pictures can increase perceived severity and efficacy (Chang, 2013), and generally can increase attention, recall, and comprehension, especially for those with low literacy skill (Houts et al., 2006).

In warning label literature, evidence of the superiority of pictorial warnings over the text-only warnings is abundant. Observational studies in high-income countries have found the superior effectiveness of PHWLs over the text-only warnings (e.g. Thrasher et al, 2007b; Borland et al, 2009; Agaku et al, 2014; Hitchman et al, 2014). Similarly, observational studies in upper-middle-income countries, like in Mexico (Thrasher et al, 2012c; Swayampakala et al, 2015), Lebanon (Alaouie et al, 2015), Malaysia and Thailand

(Yong et al, 2013), have shown that smokers respond to warnings in ways that are comparable with those from high-income countries. Stronger support for PHWLs over the text-only warnings was also provided from experimental studies in high-income countries (Cantrell et al., 2013; McQueen et al., 2015; Nan, Zhao, Yang, & Iles, 2015; Noar et al., 2015; Rousu, Marette, Thrasher, & Lusk, 2014; Thrasher, Carpenter, et al., 2012; Thrasher, Rousu, Hammond, Navarro, & Corrigan, 2011; Veer & Rank, 2012; Bansal-Travers et al, 2011) and upper-middle-income countries, like Malaysia (Fathelrahman et al., 2010) and Mexico (Hammond et al., 2012; Thrasher et al., 2012). Experimental research in high-income countries have also found that PHWLs elicit greater negative emotional reactions (Evans et al., 2015; Kees, Burton, Andrews, & Kozup, 2010; Nonnemaker et al., 2015) and are rated as having greater credibility (e.g., Cantrell et al., 2013) compared to text-only warnings. Nevertheless, these findings come from countries with more developed economies, with long histories of tobacco control and where other tobacco control policies are generally strong. Evidence from experimental research in low- and middle-income countries, like Indonesia, are still lacking. This research is particularly important for Indonesia, where tobacco control policies are generally weak, although PHWLs have been adopted, and may provide one of the few strategies for preventing tobacco use.

Pictorial Types in PHWLs

Different types of picture can generate different effects. In communication studies for example, evidence show that compared to abstract images, photographs led to more favorable attitude toward advertised brands (Babin & Burns, 1997; Miller & Stoica, 2004; Walters, Sparks, & Herington, 2007). In fear appeals literature, theorists denoted

that the effects of messages vary with the extent to which they contain gruesome content or to which the messages elicit negative reaction (O'Keefe, 1990; Witte, 1992). Evidence from PHWL research also suggests that effects of PHWLs vary with the type of images used in the content and the negative emotion such as disgust may explain audience reaction to PHWLs (Humphris & Williams, 2014).

To date, a great variety of images have been used in over 70 countries that have implemented PHWLs (Canadian Cancer Society, 2016). Following fear appeals principle, however, images used in PHWLs generally can be classified into three different types based on their goriness: 1) Graphic, defined as PHWLs that include vivid depictions of diseased or damaged body parts that result from smoking; 2) Suffering, defined as PHWLs that include personal portrayals of smoking related-health outcomes, usually showing the face of the person experiencing the consequences; and 3) Symbolic, defined as PHWLs that include symbolic or abstract representations of toxicants in cigarette products or their health consequences (e.g., a bomb to represent pending heart attack; hypodermic needle to represent addiction). This classification of message content is also in line with its audience reaction toward whereas graphic PHWLs have been found to elicit the greatest negative emotional reactions, followed by suffering, and symbolic as the least (Anshari, Yong, et al., n.d.; Hammond, Thrasher, et al., 2012; Thrasher et al., 2012).

Evidence for the greater effectiveness of graphic PHWL and suffering PHWLs over symbolic PHWLs has been provided from observational studies in high- and middle-income countries. Similarly, graphic PHWLs with vivid depictions of damaged body part have also been found to be most effective in experimental studies in high-income

countries (e.g., Thrasher, Carpenter, et al., 2012) and middle-income countries (e.g., Fong et al., 2010; Hammond, Thrasher, et al., 2012; Thrasher, Arillo-Santillán, et al., 2012), with some evidence that PHWLs that combine graphic and suffering elements are most effective (e.g., Hammond, Thrasher, et al., 2012). Recent work suggests that this pattern of responses found in experiments is similar to that which applies after smokers are exposed to PHWLs in the real-world (Huang, Thrasher, Reid, & Hammond, 2016), although an observational study in Canada, Australia and Mexico found that suffering PHWLs may be perceived as more credible, followed by graphic and symbolic PHWLs (Anshari et al, n.d.). Despite the extensive support for the effectiveness of graphic imagery over the other type of imagery, fewer studies have examined the impact of different types of textual accompaniments for pictorial imagery.

Textual Types

Textual information that accompanies imagery on PHWLs merits greater scientific attention. Most countries with PHWLs have used short, didactic textual messages that convey factual arguments about cause and effect (e.g., Smoking causes heart attacks). However, a few PHWL studies have compared effects of didactic text with short testimonials, which present information in brief personal stories. Both textual message strategies can be persuasive (e.g., De Wit, Das, & Vet, 2008; Kreuter et al., 2010), although some evidence suggests that narrative forms of communication, like testimonials, can be particularly effective (e.g., Green, 2006; Kreuter et al., 2007; De Wit, Das, &Vet 2008), while other studies have found that factual arguments in the form of statistical evidence have a stronger influence on beliefs and attitudes than narrative communication (Zebregs, van den Putte, Neijens, & de Graaf, 2015).

In narrative communication, testimonials and other forms of stories have the potential to transport their audience into the narrative world (Kreuter et al., 2007). Transported individuals are absorbed into the story, melding their attention, imagery and feelings on story events, thus making them more likely to change their real-world beliefs with ones that the story offer (Green, 2006). Furthermore, Green (2006) proposed three ways in which transportation into the story can change audience: (1) by making connections with the characters through identification, modeling, shift in norms, and emotional response; (2) by reducing counterarguing; and (3) by increasing realism with concrete examples, mental imagery and mental stimulation. Nevertheless, short version of testimonials as used in PHWL research and practice hardly meet the definition of a story in narrative communication, although one can argue that such short testimonials may tap into some elements of transportation effects, thus making them more effective than the commonly used didactic text. For example, short testimonials of someone who suffered from smoking-related diseases be more persuasive for adults than adolescents because such diseases are commonly associated with older smokers, making adolescents hardly identify with the characters in the testimonials.

Previous PHWL studies have shown mixed results when comparing testimonial and didactic textual content for PHWLs (e.g., Hammond, Reid, Driezen, & Boudreau, 2012; Hammond, Thrasher, et al., 2012; Thrasher, Arillo-Santillán, et al., 2012). An experimental study among Mexican smokers and young adults by Thrasher et al (2012) found that PHWLs with textual risk-information in didactic form was perceived as having greater credibility, relevance, and effectiveness than PHWLs with testimonials, although the results also suggested that testimonials will work better on older than younger people

and that, amongst older people, they will work as well as didactic text for smokers with lower education (Thrasher et al., 2012). On the other hand, Hammond et al (2012) found that PHWLs with short testimonial texts were rated as more effective than those with short didactic text among both Mexican smokers and youth (Hammond, Thrasher, et al., 2012) and among US adult smokers and youth (Hammond, Reid, et al., 2012). Differences in study design may account for these inconsistencies. For each health topic addressed in the PHWL, one study showed participants two elaborated testimonials and one elaborated didactic message (Thrasher et al., 2012), whereas the other study showed one short testimonial compared to multiple PHW images with the same short didactic messages (Hammond, Thrasher, et al., 2012) – hence, the novelty of the testimonial message relative to the didactic messages may help explain these discrepant findings. Further research is needed to determine the relative effects of different types of textual content, specifically with more balanced, systematic experimental manipulations of PHWL content.

Effects of Social and Psychological Factors on PHWL impacts

Communication theories and previous empirical studies suggest that social and psychological factors may enhance or reduce the effects of PHWLs.

Smoker Identity

Previous studies have shown that identity independently predicts behavioral intentions (Charng, Piliavin and Callero, 1988; Rise, Sheeran & Hukkelberg, 2010). The role of smoker identity in smoking behavior can be explained from social psychological theories of self-identity and social identity. Self-identity is the salient part of a person's self that relates to a particular behavior (Conner & Armitage, 1998). Self-identity reflects

the extent to which a person sees himself or herself as fulfilling the criteria of a particular social category. Therefore, if a person sees himself/herself as a smoker, he/she may conform to his/her self-concept (i.e. keep smoking) as a way to make his/her behavior consistent with relevant aspects of self-definition.

Social identity theory suggests a similar process. Social identity is the individual's knowledge that he/she belongs to certain social groups together with some emotional and valued significance to the group membership (Tajfel & Turner, 2004). Accordingly, the extent to which people identify themselves as a member of social group determines their tendency to act in ways that are consistent with and relevant to the social groups of which they are members. Smoker identity theory hypothesizes that the stronger identification people have with being smokers, the more likely they are to behave as smokers and the less likely they are to quit smoking.

Smoker identity, defined as the extent to which individuals self-identify with the social category of smoker (Falomir & Tomei, 2001), is associated with greater smoking frequency (Levinson et al., 2007), smoking escalation amongst youth (Hertel & Mermelstein, 2012), and with lower quit intentions (Falomir & Invernizzi, 1999) and quit attempts (Tombor, Shahab, Brown, & West, 2013). Moreover, stronger smoker identity has been associated with stronger perceived support of friends for continuing to smoke and with decreased effectiveness of anti-tobacco messages on attitudes about refraining from smoking (Falomir & Invernizzi, 1999). Hence, stronger smoker identity might undermine the effects of PHWLs on cigarette packages, especially in Indonesia where tobacco advertising, promotion and sponsorship is still ubiquitous, and tobacco marketing strategies aim to positively reinforce smoker identity (Pollay, 2000). In the long term,

PHWLs are expected to spoil smoker identity (Chapman & Freeman, 2008), which makes assessing smoker identity crucial for understanding the denormalisation of smoking. To date, however, there are no studies of the relationship between smoker identity and PHWLs.

Advertising Exposure

Indonesia allows tobacco advertising, promotions and sponsorship, with only minor restrictions (Government of Indonesia, 2012). Indeed, Indonesia is the only country in the South-East Asia region that still allows cigarette advertisements to be aired on TV and radio, and ads are also printed in newspapers, magazines, and on billboards. Among Indonesian youth ages 13-15 who participated in Global Youth Tobacco Survey (GYTS) in 2009, 89.3% of them reported that they had seen advertisements for cigarettes on billboards within the past month, and 76.6% reported seeing advertisements for cigarettes in newspapers or in magazines (WHO, 2015). Among Indonesian adults ages above 15 who participated in Global Adult Tobacco Survey (GYTS) in 2011, 84.6% of them reported that they had seen any cigarette advertisements, sponsorship and promotion within the past month (World Health Organization, 2012a).

Although tobacco companies deny that their marketing targets young nonsmokers, internal industry documents reveal an undeniable interest in marketing cigarettes to youth (Cummings, Morley, Horan, Steger, & Leavell, 2002), whose smoking behaviors the industry carefully monitors and promotes to ensure industry survival. Accordingly, cigarette product characteristics (e.g. use of filters, low tar), packaging (e.g. size, design, and color), and advertising have been developed specifically to attract teenage smokers (Pollay, 2000). For smokers who are concerned about the health risks of smoking, brands

were designed to appear lighter and healthier by portraying images that convey a sense of wellbeing, harmony with nature, and intelligence. As in the rest of the world, tobacco advertising strategies in Indonesia promote cigarette initiation among non-smoking youth, while lessening adult smokers' concerns about the health risks of smoking.

The impact of PHWLs might be undermined by tobacco advertising, which provides competing message that promote smoking (Cummings et al., 2002; Ling & Glantz, 2002; Pollay, 2000). Indeed, anti-smoking communication strategies need to break through the clutter of competing messages about smoking (Levy & Friend, 2000) that may otherwise dampen their effects (Wakefield, Flay, Nichter, & Giovino, 2003a). Research is needed to assess whether pro-tobacco advertising moderates responses to PHWLs, as this may provide further evidence for restricting advertising where it is still allowed.

Self-efficacy

Self-efficacy, defined as people's beliefs about their capabilities to exercise control over their own level of functioning and over events that affect their lives (Bandura, 1993), is central to human functioning and to theories of behavior change, such as the health-belief model (Rosenstock, Strecher, & Becker, 1988) and the theory of planned behavior (Ajzen, 1991). Indeed, people's beliefs in their capabilities have been shown to be an important predictor of many health promoting behaviors (Shannon, Bagby, Wang, & Trenkner, 1990; McAuley, 1992; Sullum, Clark, & King, 2000; Basen-Engquist & Parcel, 1992), including smoking cessation (Baldwin et al., 2006; Ockene et al., 2000; Schuck, Otten, Kleinjan, Bricker, & Engels, 2014; Spek et al., 2013). Self-efficacy is associated with short- and long-term cessation maintenance (Ockene et al.,

2000), although the directionality of the relationship is not always clear (Gwaltney, Metrik, Kahler, & Shiffman, 2009). However, findings from longitudinal studies showed that reading warning labels is a positive predictor for efficacy beliefs (Thrasher et al., 2016), and self-efficacy was also a positive predictor for thinking about the harms and for forgoing cigarettes (Thrasher et al., 2016).

In warning label research using experimental designs, self-efficacy has been studied as an outcome variable (e.g., Schneider, Gadinger, & Fischer, 2012), mediating variable (e.g., Ho, 1992), and moderating variable (Harris, Mayle, Mabbott, & Napper, 2007; Mays et al., 2014; Romer, Peters, Strasser, & Langleben, 2013). Findings from single-exposure experiments on moderation of PHWLs effects by self-efficacy (e.g., Ho, 1992; Harris, Mayle, Mabbott, & Napper, 2007; Mays et al., 2014; Romer, Peters, Strasser, & Langleben, 2013) are generally consistent with the extended parallel process model (EPPM), which posits that the effects of fear arousing messages depend both on the strength of the emotional response to the message and on the efficacy beliefs (Witte & Allen, 2000; Witte, 1994), that is, message would be accepted when both perceived threat and efficacy beliefs are high, and conversely, message would be rejected when both perceived threat and efficacy beliefs are low. However, recent observational studies have not found evidence of moderation (Thrasher et al., 2016).

More research is needed to better understand how self-efficacy influences responses to PHWL ratings. If self-efficacy (in quitting or refraining from smoking) positively influences responses to PHWLs, then the development of PHWLs should consider messaging strategies that target those with low self-efficacy. This can be done by incorporating efficacy messages, as suggested by Strahan et al (2002) and by Witte &

Allen (2000). Canada has pioneered incorporating efficacy messaging into PHWLs regulations, with some evidence supporting this approach (e.g. Hammond et al, 2004; Azagba & Sharaf, 2013; Thrasher et al, 2014).

Reactance

Psychological reactance is the motivational state when individuals perceive that their freedom is threatened and are motivationally aroused to restore their freedom (Brehm & Brehm, 2013). As such, persuasive messages can elicit reactance that compromise message effects. For example, Witte's Extended Parallel Process Model (EPPM) explains that when people are more motivated to control their fear rather than to control the danger elicited in a message, they will eliminate fear through denial, defensive avoidance, and reactance (Witte & Allen, 2000; Witte, 1992).

In warning label research, evidence for this phenomenon is mixed. For example, an experimental study with Australian adult smokers found that smokers who were exposed to graphic PHWLs were much more likely to report elevated reactance than those who exposed to the text-only warnings (Erceg-Hurn & Steed, 2011). Another experimental study with American college students also found similar results, suggesting that PHWL is counterproductive to tobacco control strategy (LaVoie, Quick, Riles, & Lambert, 2015). Meanwhile, other PHWL studies have examined the implications of reactance, finding that it does not necessarily compromise PHWL effects. For example, an online experiment with young adults in the U.S. found no support for the moderating effects of reactance when considering the effects of PHWLs on quit intention (Blanton, Snyder, Strauts, & Larson, 2014). Observational research of countries with PHWLs has found similar results (Thrasher, Swayampakala, Borland, et al., 2016). Other

observational research has even found that affective state reactance (i.e., anger) towards PHWLs is associated with stronger responses to PHWLs and greater likelihood of trying to quit, suggesting that reactance may be one of a variety of negative emotional responses that could actually promote desired behavior changes (Cho et al., 2016).

More research is needed to determine whether reactance compromises or enhances PHWL effectiveness, as well as whether reactance differs across sociocultural settings, since countries in which reactance has been studied may place especially high value on individual freedom of choice, which is the basis for reactance and its potentially negative effects.

Summary

The growing evidence for the effectiveness of PHWLs overwhelmingly came from research conducted in HICs and MICs, while tobacco use is increasing in low- and middle-income countries (LMICs). More research is needed to show whether PHWLs may have greater or lesser impacts across different population settings. Research on the specific characteristics of PHWLs (e.g., pictorial and textual types) that are most effective is also lacking, while such information is necessary for selecting specific PHWLs for use in LMICs that generally have limited resources for conducting pre-market studies. Moreover, evidence of social and psychological factors that may influence the relative effectiveness of PHWLs is also lacking, and where studies have addressed these issues, the results are rather mixed.

The EPPM suggests that self-efficacy moderates the impact of fear arousing messages, but results from experimental and observational studies provide inconsistent support for this contention. The EPPM also suggests that fear arousing messages may

evoke reactance that, in turn, will diminish message effects on the desired outcome, but findings were also still mixed. Other than self-efficacy and reactance, identity of smokers is also thought to have influences on smoking cessation, but no study have assessed its influence on PHWL impact. Lastly, and specifically for the Indonesian context where tobacco advertising is still allowed across the range of mass media, competing messages from advertising exposure may reduce PHWL effectiveness, but no study has directly addressed this potential concern. Additionally, implementation of PHWLs in Indonesia may need to be adjusted to its social cultural context, such as its lower-middle-income status, the highly disproportionate prevalence of male smokers over female smokers, the high use of clove cigarettes, and the relatively small display area for PHWL on cigarette packs (i.e., 40% of the front and back of the cigarette pack as oppose to 85% in Thailand).

Our study objective is to determine the most effective PHWL content for Indonesia, including assessment of the similarities and differences in PHWL responses between Indonesians and other countries. The results were provided to the Indonesian Ministry of Health to inform the selection of PHWL content for the second round of PHWLs. The PHWLs used in this study were classified into four types, ranging from the most frightening to the least frightening based on the fear appeal theory (Witte, 1992):

1) Graphic imagery: Vivid depiction of negative health consequences or physical effects of smoking;
2) Suffering imagery: Personal lived experience and portrayal of smoking-related health outcomes, including negative social and emotional impact on quality of life;

3) Symbolic imagery: Abstract or symbolic representation of the negative effects of smoking; and
4) No image: Health warning that contains only text.

To assess the impact of textual content, participants were randomized to view textual messages that were either: 1) brief testimonials or: 2) a short didactic textual. This study had the following specific aims:

Specific Aim 1

The first aim of this study is to assess which different imagery types and textual strategies for PHWLs are most likely to enhance understanding of tobacco-related risks and to reduce tobacco use among Indonesian adult smokers and adolescents. Communication theory and evidence from health communication research suggest that text with picture may be more persuasive than text alone (Chaiken, 1980; Chang, 2013; Houts et al., 2006; Petty & Cacioppo, 1986; Slovic et al., 2007; Strahan et al., 2002). Previous studies in other countries have also found that PHWLs are more effective than warning labels that contain only text (e.g., Alaouie, Afifi, Haddad, Mahfoud, & Nakkash, 2015; Brewer et al., 2016; Evans et al., 2015; Huang, Thrasher, Reid, & Hammond, 2016). Furthermore, theory suggests that PHWL effects may vary with the extent to which they contain gruesome content or to which they elicit negative emotion (O'Keefe, 1990; Witte, 1992), and past research in other countries has showed PHWLs with graphic and suffering imagery appear more effective than those with symbolic imagery (Anshari, Yong, et al., n.d.; Hammond, Thrasher, et al., 2012; Thrasher et al., 2012). The current study aims to determine whether PHWL effects work similarly among Indonesian smokers and adolescents. Four warning imagery types as mentioned above were

systematically manipulated using a within-subject design in order to test the following hypotheses:

Hypothesis 1: Ratings of PHWLs on negative emotional responses, message credibility and perceived effectiveness will be stronger than the text-only warnings.

Hypothesis 2: Among PHWLs, ratings of negative emotional responses, message credibility and perceived effectiveness will be strongest for those with graphic imagery, followed by those with suffering and symbolic imagery.

The textual type for messages might also produce different impacts. Currently, didactic text (i.e., citing facts or statistics) is the predominant style for both text-only and pictorial warnings. On the other hand, testimonials and other forms of stories have the potential to absorb audiences' attention, imagery and feelings on story events, making them more likely to change their beliefs and behavior according to the story (Green, 2006). Although the testimonials used in PHWL usually in a much shorter version than those use in narrative communication literature, further research is merit to assess its relative effectiveness compare to the commonly used didactic text. Countries like Canada and Australia have incorporated brief testimonials in some of their PHWLs (see tobaccolabels.ca for examples). In warning label studies, however, comparisons of testimonial and didactic strategies have produced mixed results (e.g., Hammond et al., 2012; Thrasher, Arillo-Santillán, et al., 2012). To determine the effect of testimonial textual type on responses to warning labels, a between-subject manipulation was included in the study design, whereby participants were randomly assigned to rate warnings with

either didactic texts (condition 1) or testimonial texts (condition 2).

Hypothesis 3: Compared to warnings with didactic messages, warnings with testimonials will be rated greater on all outcomes, and association between textual type and outcomes will be stronger among adult smokers than among adolescents.

Specific Aim 2

The second aim of this study is to assess main and moderating effects of social and psychological factors on the effects of PHWLs toward the three outcomes, for which there is theoretical or empirical basis for moderation.

Smoker identity

Stronger identification with a smoker identity is associated with lower likelihood of quitting smoking (Hertel & Mermelstein, 2012; Levinson et al., 2007) and weaker impact of anti-tobacco messages (Falomir & Invernizzi, 1999). Based on these findings, we hypothesize the following:

Hypothesis 4: Among smokers, smoker identity will have an inverse association with warnings ratings and moderate the effects of warnings, such that the relationship between warning label characteristics and ratings of warning labels on negative emotional responses, message credibility and perceived effectiveness will be stronger for those with weaker smoker identity than for those with stronger smoker identity.

Advertising exposures

Indonesia is the only country with PHWLs while also allowing cigarette advertisements on traditional mass media (i.e., TV, radio, newspaper, magazines,

billboards). Just as pro-tobacco advertising might reduce the effects of anti-smoking campaigns on youth smoking uptake (Wakefield et al., 2003a), so it might moderate PHWL effects.

Hypothesis 5: Self-reported frequency of exposure to cigarette advertisements will have an inverse association with warning ratings and will moderate the effects of warnings, such that the relationship between warning label characteristics and ratings of warning labels on negative emotional responses, message credibility and perceived effectiveness will be weaker for those with high exposure to cigarette advertisements than for those with low exposure to cigarette advertisements.

Self-efficacy

The extended parallel process model (EPPM) posits that the effects of fear arousing messages depend both on the strength of the emotional response to the message and on the efficacy beliefs, including self-efficacy (i.e., confidence) to engage in the recommended behavior (Witte, 1992). In studies of warning labels among adult smokers, self-efficacy to quit smoking is positively associated with desirable warning label responses (e.g., Fathelrahman et al., 2009; Partos, Borland, Yong, Thrasher, & Hammond, 2013); however, evidence for the moderation of warning effects by self-efficacy is still mixed (e.g., Ho, 1992; Romer, Peters, Strasser, & Langleben, 2013; Thrasher et al., 2016).

Hypothesis 6: Among smokers, self-efficacy will be positively associated with warning responses and will moderate the effects of warning labels, such that the relationship between warning label characteristics and ratings of warning

labels on negative emotional responses, message credibility and perceived effectiveness will be stronger for those with high self-efficacy than for those with low self-efficacy.

Reactance

Psychological reactance theory posits that individuals are motivated to restore their freedom when they perceive that their freedom is threatened (Brehm & Brehm, 2013). According to the EPPM, fear arousing messages can create reactance when people are more motivated to control their fear, rather than to control the danger as elicited in the messages (Witte & Allen, 2000; Witte, 1992, 1994). In warning label research, evidence on the effects of reactance is mixed (e.g., Blanton, Snyder, Strauts, & Larson, 2014; Cho et al., 2016; Erceg-Hurn & Steed, 2011; LaVoie, Quick, Riles, & Lambert, 2015).

Hypothesis 7: Reactance will be positively associated with negative emotional responses but negatively associated with message credibility and perceived effectiveness, and will moderate the effects of warning labels, such that the relationship between warning label characteristics and ratings of warning labels on outcomes will be weaker for those with higher reactance than for those with lower reactance.

By meeting the two specific aims above, this study will provide the evidence needed to inform the future development of PHWLs in Indonesia and contribute to the growing science on the specific characteristics of PHWLs that are most effective.

Conceptual Model

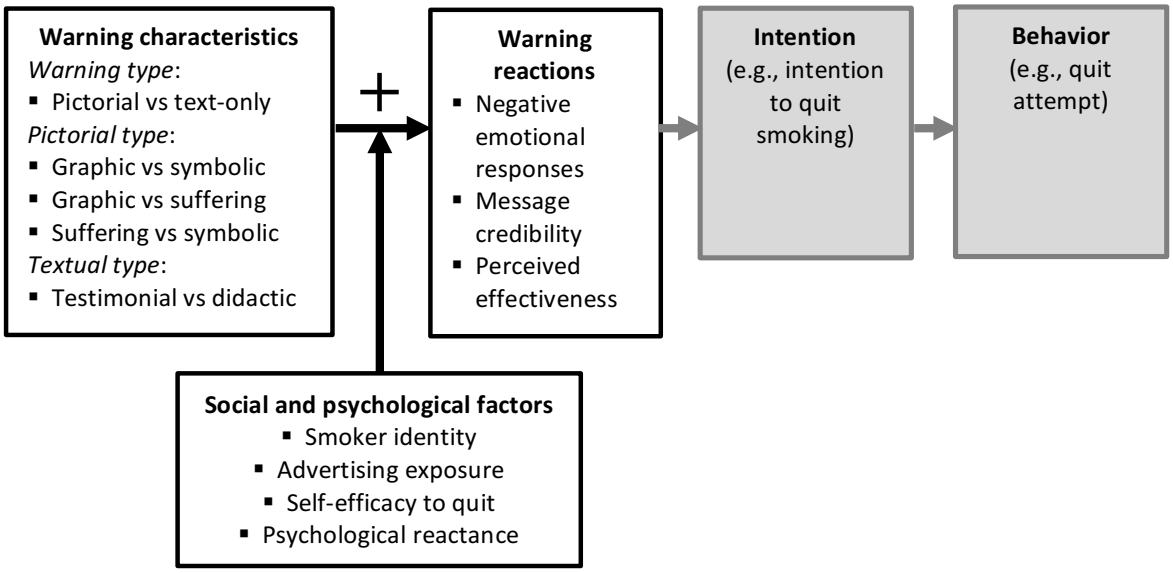


Figure 2.2 Relationship between warning characteristics, moderators and warning reactions (scope of this study), and expected behavior change.

CHAPTER 3

METHODOLOGY

In this chapter, we will describe our study design and protocol, stimuli development process, sample, measurement and specification of variables, and data analysis.

Study Design and Protocol

The study design involved both between-subject (i.e., textual type) and within-subject (i.e., imagery type) manipulations. After determining eligibility and receiving consent, participants answered a brief survey on demographics and smoking behaviors, after which they were randomly assigned into either the didactic or testimonial condition (i.e., the between subject manipulation). Each condition included eight sets of stimuli in the form of warning labels addressing a range of different health topics associated with smoking (i.e., addiction, heart disease, death, lung cancer, mouth cancer, throat cancer, secondhand smoke, and impotence). Each set of stimuli included a text-only version and, to the extent possible, three different pictorial types (i.e., graphic, suffering, and symbolic), resulting four to six stimuli in each set. Eight sets of stimuli in the didactic condition and eight sets of stimuli in the testimonial condition were identical in terms of health topics, imagery type, and number of stimuli (i.e., 41 stimuli in each condition). To reduce participant burden, participants in each condition were randomly assigned to assess only two out of the eight sets of stimuli. As a result, each participant rated 9 to 11 stimuli that differ in term of imagery type (i.e., the within-subject manipulation: no

imagery/text-only; graphic imagery of diseased/damaged body part; suffering imagery of the smoker and/or an affected family member; symbolic imagery with abstract representations of risk or danger). To reduce biases due to ordering effects, the stimuli within each set were presented in random order.

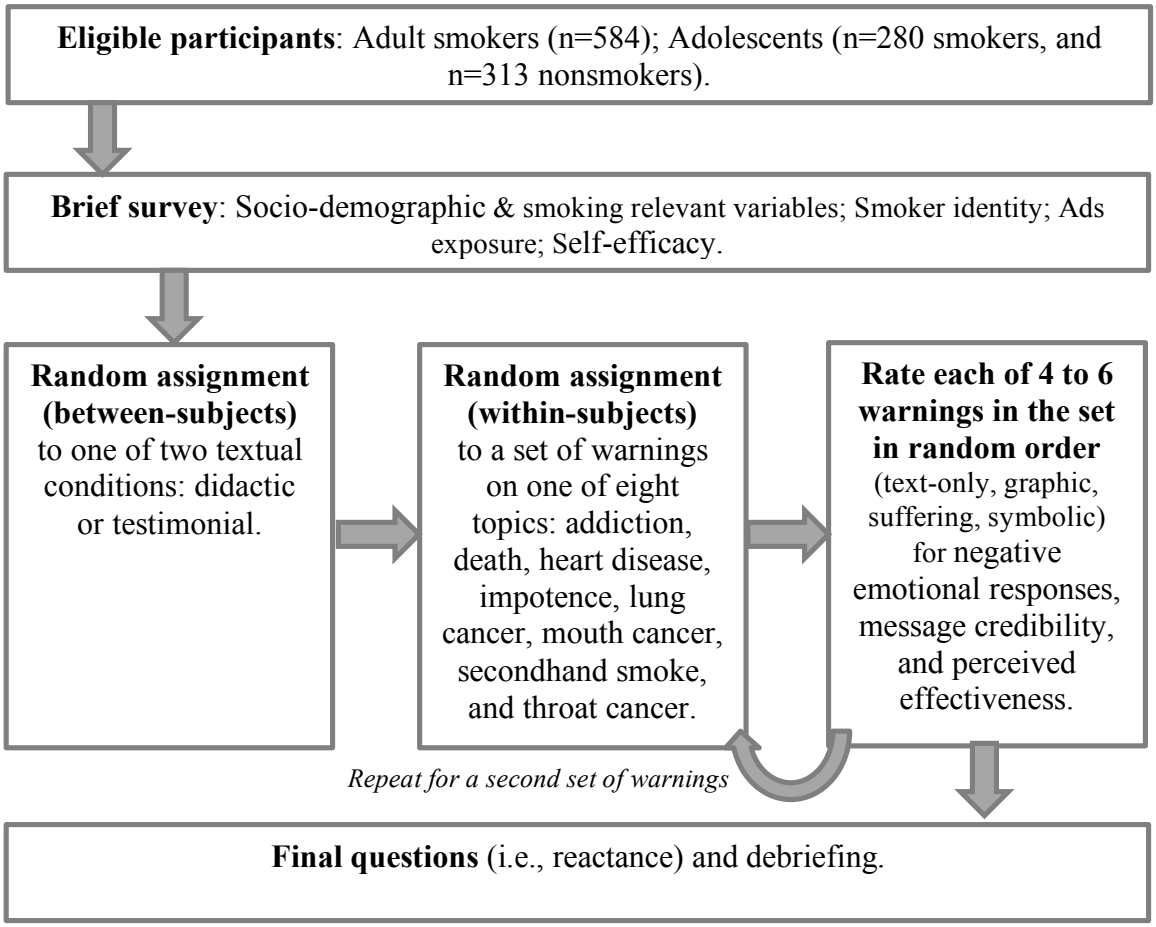


Figure 3.1 Study protocol flowchart

The questionnaire was designed by the research team and then translated into Bahasa Indonesia. The translated questionnaire was then pretested using cognitive interviewing techniques (Willis, 2004) with adults (n=8) and adolescents (n=8) to ensure that the questions were understood clearly by respondents. An iPad based computer-

assisted personal interviewing (CAPI) program was specifically developed for this study and pretested with adults (n=16) and adolescents (n=16) prior the data collection. The survey program was designed to be self-administered with guidance from interviewers. For ease of conducting the randomized experiments, each stimulus was shown to participants on an iPad as a stand-alone image (i.e., not as a part of the cigarette pack) with the size comparable to that which characterizes the Indonesian regulation for PHWLs (475 by 380 pixels). Participants rated the stimuli, one at a time (see measurement, below), after reviewing the stimulus on the iPad. Participant responses were automatically saved in the iPad and then uploaded to an online database at the end of each day. The study protocol was reviewed and approved by Ethics Review Board of the Faculty of Public Health, Universitas Indonesia, while the analysis plan was reviewed and approved by the IRB of the University of South Carolina.

Stimuli Development

Selection of images in PHWLs involved consideration of those used in prior studies (e.g., Hammond et al, 2012) and actual PHWLs implemented in different countries (Canadian Cancer Society, 2014). To the extent possible, imagery used in other countries or that was available for low cost was used because the results were to inform specific recommendations to the Indonesian Ministry of Health for content in the second round of PHWLs. Some PHWL imagery was shot with Indonesian subjects to ensure visual fit of imagery within the cultural context. For example, of the 41 PHWLs used, 15 were re-photographed with Indonesians as the models. Real victims of smoking-related diseases (i.e., lung and throat cancers patients) were recruited, because the Ministry of Health would need to have this information if the images selected for use in PHWLs. A

graphic designer edited all the images, including those used in prior studies, so that they matched the warning size format specified by Indonesian regulations (i.e., cover 40% of the pack). The five PHWLs that already had been selected for use in the first PHWL round in Indonesia were also included to evaluate their performance relative to other options (see Figure 2.2). Workshops with Ministry of Health representatives and other stakeholders (e.g., physicians, health promotion experts, NGOs, smokers and ex-smokers) were held to select the final warnings used in this study (see Figure 3.2 for example and Appendix A for all selected stimuli in this study).

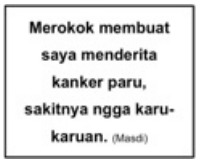
	Text-only	Symbolic	Suffering	Graphic
Didactic "Smoking causes lung cancer"				
Testimonial "I am suffering from lung cancer because of smoking. (Masdi)"				

Figure 3.2 Example of image and text types used as study stimuli

Sample

Data were collected from a convenience sample of 15- to 18-year-old adolescents (n=280 smokers; n=313 nonsmokers) and adult smokers (n=584), half of whom were recruited in the city of Jakarta and half in a suburb area of Bogor district. Adult smokers were recruited in both areas using comparable street intercept techniques in public places (e.g., malls, supermarkets, restaurants, government offices). Adolescents were mostly recruited from public and private schools in the two areas. Schools were selected

purposively to represent the proportion of students enrolled in public and private schools in Jakarta (three public and two private schools) and Bogor (three public and two private schools). Selection of adolescent participants was based on student lists provided by the schools' administrator, with every third of name on the list selected until quotas were met (range of quota was 40 to 60 respondents per school, half of whom were smokers and another half were non-smokers). Participants who completed the interview received incentives of Rp 50,000 (US$6) phone cards. Data were collected from May 28th to June 16th, 2014.

Measures and specification of variables

Warning label characteristics

Three main independent variables were generated based on the warning label characteristics: warning types (text-only warning versus pictorial warning), image types (graphic, suffering, and symbolic), and textual types (didactic versus testimonial).

Warning label ratings

Ratings of warning labels assessed key domains of reactions to warning and perceived effectiveness (Noar, Hall, et al., 2016) using measures from other studies (Hammond, Thrasher, et al., 2012; Thrasher, Arillo-Santillán, et al., 2012) with response options ranging from 1 (not at all) to 10 (extremely):

1. Negative emotional responses, defined as negative emotional reactions to the warning, was assessed with three questions on affective responses (i.e., This warning message is frightening; This warning message is disgusting; This warning message is unpleasant). These measures had high internal consistency across conditions (alpha=0.88-0.90) and different image types (alpha=0.82-0.89),

and so these were averaged.

2. Message credibility, defined as perception of truthfulness or believability of the warning messages, was assessed with a single item (i.e., This warning message is believable).
3. Perceived effectiveness, defined as perception about the effectiveness of warning messages in rising concerns about the health risks and motivating participants or others to not smoking, was measured with four items (i.e., This warning message would help prevent young people from starting to smoke; This warning message makes you more concerned about the health risks of smoking; This warning message makes you not want to smoke; Overall, how effective is the warning?). These four items have high internal consistency across conditions (alpha=0.86-0.90) and for different image types (alpha=0.83-0.89), and so these were averaged.

Moderating variables

Smoker Identity: For both adult and adolescent smokers, smoker identity was assessed with three Likert-scale items selected from other studies (Falomir & Invernizzi, 1999; Hertel & Mermelstein, 2012; Tracy, Lombardo, & Bentley, 2012): "How much is being a smoker part of who you are?" (1='not at all' to 5='a lot'); "To what extent do your friends see you as a real smoker?" (1='not at all' to 5='a lot'); "How important are cigarettes in your life?" (1='not at all important' to 5='the most important'). Internal consistency was adequate (alpha=0.70), so responses were averaged with higher scores reflecting a stronger smoker identity.

Advertising Exposure: Exposure to cigarette advertising was assessed by asking how often in the past 30-days participants had seen ads for cigarettes: when watching TV; when reading newspapers or magazines; on a billboard; and when visiting a convenience store or market. Response options ranged from 1 (never) to 5 (very often) and were averaged to create an index. The first two items were adapted from a longitudinal study measuring the effect of tobacco advertising on adolescents smoking susceptibility (Weiss et al., 2006). The last two items were adapted from the National Youth Tobacco Survey (Centers for Disease Control and Prevention, 2011).

Self-Efficacy: Two items were used to measure smoker participants' efficacy beliefs around quitting smoking. The first item was adapted from previous studies (Harris et al., 2007; Lipkus & Shepperd, 2009): "Overall, how confident are you that you can stop smoking altogether right now?" (1='not at all' to 5='completely confident'); while the second item was modified from another study (Fathelrahman et al., 2009): "How confident are you that you can completely avoid smoking in the future?" (1='not at all' to 5='completely confident'). This measure of self-efficacy yielded adequate internal consistency (alpha=0.63), and the responses were averaged.

Reactance: After rating warnings, participants were asked about their general responses to the set of warnings that they had evaluated, including both perceived threat to freedom (i.e., Health warnings on cigarette packages try to make a decision for me, try to pressure me, threaten my freedom to choose, try to manipulate me) and negative feelings (i.e., angry, annoyed, irritated, aggravated) (Dillard & Shen, 2005). Response options ranged from 1 (not at all) to 10 (extremely). Both measures had good internal consistency (alpha=0.79 and 0.85, respectively), and so were averaged (alpha=0.85).

Sociodemographic and smoking status

Demographic variables included gender and age group (adolescent=15-18 year, adult=19-65 year). Smoking status was determined from answers to the question: ‘‘In the last 30 days, how often did you smoke cigarettes?’’ Adolescents were classified as smoker only if they answered “every day”, “at least once in a week”, or “at least once in the last month”, while those who answered “not at all” were classified as non-smoker. All adult participants were smokers.

Among smokers, quit intentions were assessed by asking ‘‘Are you planning to quit smoking cigarettes: within the next month, within the next 6 months, sometime in the future, or are you not planning to quit?’’, which was adapted from previous studies (e.g., Fathelrahman et al., 2009; Reid, Hammond, Boudreau, Fong, & Siahpush, 2010). The first two options were coded as having quit intention within the next 6 months, while the last two were coded as not having quit intention within 6 months. Smokers were also asked about the number of cigarettes they smoked per day and time to first cigarette after waking up to create the Heaviness of Smoking Index (HSI), which is a good indicator of nicotine dependence (Kozlowski, Porter, Orleans, Pope, & Heatherton, 1994), and reliable predictor of quitting (Borland, Yong, O’Connor, Hyland, & Thompson, 2010). Additionally, smokers were asked about their preferences for cigarette’s flavors (“clove”, “non-clove”, or both), and for cigarette’s filter type (“with filter”, “without filter” or “no preference”).

Data Analysis

All analyses were conducted using Stata version 12 (StataCorp, 2011). Differences in participant characteristics across the health topics (Table 4.1) and textual

style conditions (Table 4.2) to which they were randomly assigned were assessed using *t*-tests and chi-square tests. Mean ratings were determined for each warning, examining the distribution of responses (see Appendix A). To adjust for correlated data due to repeated measures, linear mixed effects (LME) models were estimated separately for each of the three key outcomes (i.e., negative emotional responses, message credibility and perceived effectiveness), regressing them on PHWL characteristics of interest (i.e., text vs. pictorial; didactic vs. testimonial; differences in PHWL imagery with suffering imagery as the reference for symbolic imagery and graphic imagery). Because the perceived effectiveness scale is made up from four items that may assess different behavioral targets, a sensitivity analysis was conducted using each of the four individual items as the outcome. In models that included individual item of perceived effectiveness, the results from each adjusted model reported in this paper were consistent in their direction, magnitude, and significance (see Appendix B for results).

Bivariate models were firstly used to determine main effects of selected warning characteristics on outcomes. After that, adjustment variables (i.e., age group, gender, smoking status, and warning topics) were included in each model. Interaction terms between textual type and age group of participants were added into the models. Dummy coded variables of textual type (i.e., testimonial=0 and didactic=1) and age group of participants (i.e., adult=0 and adolescent=1) were multiplied to create the interaction variable. Where interactive effects were significant, models were stratified by age groups.

To estimate the main and interactive effects of PHWL characteristics and participant characteristics on outcomes, linear mixed effects (LME) models were used to adjust for correlated data due to repeated measures. LME models were estimated

separately for each of the three key outcomes (i.e., negative emotions, credibility and perceived effectiveness) and each primary independent variable was included in the model separately. Bivariate and adjusted models were used to determine main effects of selected participants' characteristics on outcomes. Adjustment variables included sociodemographic variables (i.e., age group, gender, educational level) and smoking relevant variables (e.g., smoking status, health topics of HWLs). The analytic sample for models testing smoker identity and self-efficacy involved only smokers, therefore, adjustment variables excluded smoking status, but included the HSI, quit intention, cigarette's flavors, and cigarette's filter type. After that, the moderation hypotheses were tested by re-estimating these adjusted models by entering a multiplicative interaction term between a primary independent variable and a warning characteristic, one at a time. For example, for the model assessing negative emotional responses with self-efficacy as the primary independent variable, an interaction term between image style and self-efficacy was created and added into the model. Where interactive effects were statistically significant, stratified models were estimated after taking the median value to split the sample by different levels of the participant characteristic of interest.

CHAPTER 4

RESULTS

Manuscript 1[1]

Effects of imagery and textual types on negative emotional responses, message credibility, and perceived effectiveness of health warning labels for Indonesia's cigarette packs

ABSTRACT

Objective: To assess which imagery and textual types for pictorial health warning labels (PHWL) are most likely to reduce smoking among adult smokers and adolescents in Indonesia.

Methods: This experimental study collected data from adolescents (n=280 smokers; n=313 nonsmokers) and adult smokers (n=584) in Jakarta city and Bogor district. For eight health topics, warning characteristics were experimentally manipulated to assess the effects of warning type (text-only versus pictorial warnings), imagery type (graphic, suffering, and symbolic), and textual type (didactic versus testimonial) on negative emotional responses, message credibility, and perceived effectiveness. To adjust for correlated data due to repeated measures, linear mixed effects models were estimated separately for each outcome, regressing ratings on warning characteristics and adjustment variables.

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Results: Compared to text-only warnings, PHWLs were rated higher for all outcomes. Within the PHWLs, symbolic images were rated lower than suffering images for all outcomes. Graphic images were rated higher than suffering images for all outcomes. Ratings of didactic PHWLs were not significantly different than for testimonials on any outcomes. However, significant interactions between textual types and age group were observed for models of credibility and perceived effectiveness, suggesting that didactic PHWLs were perceived as more credible and effective than testimonials among adolescents, with no difference among adults.

Conclusion: PHWLs with didactic text and graphic imagery appear likely to have the greatest impact among Indonesian adult smokers and adolescents. These findings are similar to those from research in higher income countries, suggesting that PHWLs operate in similar fashion across sociocultural contexts.

INTRODUCTION

More than two thirds of tobacco-related deaths occur in low- and middle-income countries (LMICs) (Eriksen et al., 2015) like Indonesia, the fourth largest country in the world. In fact, smoking-attributable death is higher than in other countries (World Health Organization, 2012b), suggesting that Indonesia needs stronger policies to reduce tobacco use. The World Health Organization's Framework Convention on Tobacco Control (WHO-FCTC) recommends adoption of pictorial health warning labels (PHWL), which have been implemented by over 70 countries (Canadian Cancer Society, 2016).

Communication theory and research suggested that text with picture may be more persuasive than text alone (Chaiken, 1980; Chang, 2013; Houts et al., 2006; Petty &

Cacioppo, 1986; Slovic et al., 2007; Strahan et al., 2002). In warning label literature, studies in developed countries have shown that PHWLs increase knowledge about smoking risks (Hammond et al., 2006) while also promoting psychological responses that are related to smoking cessation, such as negative emotional reactions (Andrews, Netemeyer, Kees, & Burton, 2014; Hammond et al., 2004; Kees et al., 2010), and cognitive responses, such as message credibility (Cantrell et al., 2013) and perceived effectiveness (Hammond, 2011; Hammond et al., 2007; Noar, Hall, et al., 2016); however, PHWL research is generally lacking in the LMICs that increasingly bear the burden of tobacco use.

Observational studies in high-income countries (HICs) have provided consistent evidence for the superior effectiveness of PHWLs over the text-only warnings (Agaku, Filippidis, & Vardavas, 2014; Bansal-Travers, Hammond, Smith, & Cummings, 2011; Ron Borland et al., 2009; Hitchman, Driezen, Logel, Hammond, & Fong, 2014; Thrasher et al., 2007). Similarly, observational studies in middle-income countries (MICs), like in Mexico (Swayampakala et al., 2015; Thrasher, Pérez-Hernández, Arillo-Santillán, & Barrientos-Gutiérrez, 2012a), Lebanon (Alaouie et al., 2015), Malaysia and Thailand (Yong et al., 2013) have shown that smokers respond to warnings in comparable manner with those from HICs. Further supports for the superiority of PHWLs over text-only warnings has also come from experimental studies in HICs (Cantrell et al., 2013; McQueen et al., 2015; Nan, Zhao, et al., 2015; Noar, Hall, et al., 2016; Rousu et al., 2014; Thrasher et al., 2012, 2011; Veer & Rank, 2012) and MICs, like Malaysia (Fathelrahman et al., 2010) and Mexico (Hammond, Thrasher, et al., 2012; Thrasher et al., 2012). Experimental research in HICs have also found that PHWLs evoke greater

negative emotional reactions (Kees et al., 2010; Nonnemaker et al., 2015) and are perceived as more credible than text-only warnings (Cantrell et al., 2013).

Different types of picture can generate different effects (Babin & Burns, 1997; Miller & Stoica, 2004; Walters et al., 2007). Similarly, according to fear appeals theory, the effects of messages may vary with the extent to which they contain gruesome content or to which the messages elicit negative reaction (O'Keefe, 1990; Witte, 1992). Past research also found that the effects of PHWLs vary with the type of images used and negative emotion such as disgust may explain reaction to PHWLs (Humphris & Williams, 2014). Based on their gruesomeness, imagery used in PHWLs generally can be classified into three types: 1) Graphic: vivid depiction of diseased/damaged body part as consequences from smoking; 2) Suffering: personal portrayals of smoking-related health outcomes, usually showing the face of the person experiencing the consequences; and 3) Symbolic: abstract or symbolic representations of toxicants in cigarette products or their health consequences. Evidence for the greater effectiveness of graphic and suffering PHWLs over symbolic PHWLs has been provided from observational studies in HICs and MICs (Gravely et al., 2014; Thrasher et al., 2010). Similarly, graphic PHWLs have also been found to be most effective in experimental studies in HICs (Thrasher et al., 2012) and MICs (Fong et al., 2010; Hammond, Thrasher, et al., 2012; Thrasher et al., 2012), with some evidence that PHWLs that combine graphic and suffering elements are most effective (Hammond, Thrasher, et al., 2012). Recent work suggests that this pattern of responses in experiments is similar to that which applies after smokers are exposed to warnings in the real-world (Huang et al., 2016). Despite the extensive support for the

effectiveness of graphic imagery over other type of imagery, fewer studies have examined the impact of different types of textual accompaniments for this imagery.

Textual information that accompanies imagery on PHWLs merits greater scientific attention. Most countries with PHWLs have used short, didactic textual messages that present factual arguments about cause and effect (e.g., Smoking causes heart attacks). However, a few PHWL studies have compared effects of didactic text with short testimonials, which present information in brief personal stories. Both textual message strategies can be persuasive (De Wit et al., 2008; Kreuter et al., 2010), however, some evidence suggests that testimonials and other forms of narratives can be particularly effective because they can absorb audiences' attention, imagery and feelings on story events (Green, 2006; Kreuter et al., 2007). Although short version of testimonials as used in PHWL research and practice hardly meet the definition of a story in narrative communication, one can argue that such short story may tap into some elements of transportation into the narrative world, thus making them more persuasive than the commonly used didactic text. For example, because smoking-related diseases are associated with older smokers, short testimonials of those who suffered from such diseases may be more persuasive for adults than adolescents with whom they may not identify.

Previous studies have found mixed results when comparing testimonial and didactic textual content for PHWLs (Hammond, Thrasher, et al., 2012; Hammond, Reid, et al., 2012; Thrasher et al., 2012). One experimental study among Mexican smokers and young adults found that PHWLs with didactic text was perceived as having greater credibility, personal relevance, and effectiveness than PHWLs with testimonials

(Thrasher et al., 2012). However, testimonials appeared to be more effective amongst older than younger people, particularly amongst older people with lower education (Thrasher et al., 2012). Other studies found that PHWLs with short testimonial texts were rated as more effective than those with short didactic text among both Mexican smokers and youth (Hammond, Thrasher, et al., 2012) and among US adult smokers and youth (Hammond, Reid, et al., 2012).

Differences in study design may account for these inconsistencies. For each health topic addressed in the PHWL, one study showed participants two elaborated testimonials and one elaborated didactic message (Thrasher et al., 2012), whereas another study showed one short testimonial compared to multiple PHW images with the same short didactic messages (Hammond, Thrasher, et al., 2012) – hence, the novelty of testimonials relative to the didactic messages may help explain these discrepant findings. To determine the relative effects of different types of textual content, further studies are needed with more balanced, systematic experimental manipulations of PHWL content. Nevertheless, these studies suggest that testimonial text may have advantages over didactic text, particularly among adult smokers.

Study Context & Aims

Indonesia is the key market for transnational tobacco companies (Hurt et al., 2012; Mackay, Ritthiphakdee, & Reddy, 2013), especially given its weak tobacco control environment. Over 30% of Indonesians smoke, which is mostly accounted for by the high prevalence of smoking amongst males (57%) (World Health Organization, 2015). Although Indonesia is not among the 180 parties to the WHO-FCTC, in 2012 the Indonesian government authorized a tobacco control regulation (Government of

Indonesia, 2012), including PHWLs to cover 40% of the front and 40% of the back of cigarette packages. This is generally in accordance with WHO-FCTC's guidelines for PHWLs (World Health Organization, 2008). The first round of PHWLs was implemented on June 24th, 2014, including five PHWLs accompanied by short didactic text. To date, however, research on PHWLs in Indonesia is lacking. This research is particularly important for Indonesia and may provide one of the few strategies for preventing tobacco use, especially when tobacco control policies other than PHWLs are generally weak.

This experimental study aimed to assess which different imagery and textual types for PHWLs are most likely to reduce tobacco use among Indonesian smokers and adolescents. Specifically, we proposed and assessed the following hypotheses: 1) Compared to text-only warnings, PHWLs will produce significantly stronger ratings of negative emotional responses, message credibility, and perceived effectiveness; 2) Among PHWLs, ratings of negative emotional responses, message credibility, and perceived effectiveness will be strongest for PHWLs with graphic imagery, followed by suffering imagery and, finally, symbolic imagery; 3) Compared to PHWLs with didactic text, those with testimonials will be rated greater on all outcomes, and association between textual type and outcomes will be stronger among adult smokers than among adolescents.

METHODS

Study Design and Protocol

The study design involved between-subject (i.e., textual strategies) and within-subject (i.e., warning and imagery types) manipulations. First, participants were randomly assigned into either the didactic or testimonial conditions (i.e., the between

subject manipulation). Each condition included eight sets of stimuli in the form of warning labels addressing health topics associated with smoking (i.e., addiction, heart disease, death, lung cancer, mouth cancer, throat cancer, secondhand smoke, and impotence). Each set of stimuli included a text-only version and, to the extent possible, three different imagery types (i.e., graphic, suffering, and symbolic), resulting in four to six stimuli in each set. Sets of stimuli in the didactic and the testimonial conditions were identical in terms of health topics, imagery type, and number of stimuli (i.e., 41 stimuli in each condition). To reduce participant burden, participants in each condition were randomly assigned to assess only two out of the eight sets of stimuli. As a result, each participant rated 9 to 11 stimuli that differed in term of imagery type (i.e., the within-subject manipulation: text-only; graphic; suffering; and symbolic). Stimuli within each set were presented in random order to reduce confounding due to ordering effects.

The questionnaire was designed by the research team, translated into Bahasa Indonesia, and pretested using cognitive interview techniques(Willis, 2004) with adults (n=8) and adolescents (n=8) to ensure that the questions were understood clearly by respondents. An iPad based computer-assisted personal interviewing (CAPI) program was specifically developed for this study and pretested prior the data collection. The survey program was designed to be self-administered with guidance from interviewers. For ease of conducting the randomized experiments, each stimulus was shown to participants on the iPad as a stand-alone image (i.e., not as a part of the cigarette pack), with the size comparable to that which was later implemented on packs (475 by 380 pixels). Participants rated the stimuli, one at a time, after reviewing each stimulus on the iPad. Participant responses were automatically saved in the iPad and then uploaded to an

online database at the end of each day. The study protocol was reviewed and approved by Ethics Review Board of the Faculty of Public Health, Universitas Indonesia.

Stimuli Development

Selection of images in PHWLs involved consideration of those used in prior studies (Hammond, Thrasher, et al., 2012) and actual PHWLs implemented in different countries (Canadian Cancer Society, 2012), including five PHWLs that already had been selected for the first PHWL round in Indonesia (but not yet implemented at the time of the study) to evaluate their performance relative to other options. To the extent possible, imagery used in other countries or that was available for low cost was used because the results were to inform specific recommendations to the Ministry of Health Republic of Indonesia (MoH-RI) for content in the second round of PHWLs. To ensure visual fit of imagery within the cultural context, 15 of the 33 images used were re-photographed with Indonesians as the models, including with ex-smokers who suffered from lung and throat cancers. A graphic designer edited all the images to match the size format specified by MoH-RI. Workshops with MoH-RI representatives and other stakeholders (e.g., physicians, health promotion experts, NGOs, smokers and ex-smokers) were held to select the final warnings used in this study.

Sample

Data were collected from adolescents aged 15-18 years (n=280 smokers; n=313 nonsmokers) and adult smokers (n=584), half of whom were recruited in Jakarta city and half in Bogor district. Adult smokers were recruited in both areas using street intercept techniques from public places (e.g., malls, supermarkets, restaurants, government offices). Adolescents were mostly recruited from six public and four private schools that

were selected purposively to represent the proportion of school enrollment in both areas. Selection of adolescent participants was based on student list, with every third of name in the list selected until quota of 40-60 respondents per school (with half of them were smokers and another half were non-smokers) was met. Participants who completed the interview received incentives of Rp 50,000 (US$6) phone cards. Data were collected from May 28th to June 16th, 2014.

Measures and specification of variables

Warning label characteristics

Three main independent variables were used, based on manipulation of warning label characteristics: warning types (text-only versus pictorial warnings), imagery types (graphic, suffering, and symbolic), and textual types (didactic versus testimonial).

Warning label ratings

Ratings of warning label assessed key domains of reactions to warnings (Noar, Hall, et al., 2016) using measures from other studies (Hammond, Thrasher, et al., 2012; Thrasher et al., 2012) with response options ranging from 1 (not at all) to 10 (extremely). Negative emotional responses, defined as negative emotional reactions when viewing the warning, was assessed through ratings from three questions on affective responses (i.e., This warning message is frightening; This warning message is disgusting; This warning message is unpleasant). Internal consistency for these three items was good across all samples (alpha=0.89) and for different imagery types (alpha=0.82-0.89), so these were averaged. Message credibility, defined as perception of truthfulness or believability of the warning messages, was assessed with a single item (i.e., This warning message is believable). Perceived effectiveness, defined as perception about the effectiveness of

warning messages in motivating participants or others to not smoke, was measured with four items (i.e., This warning message would help prevent young people from starting to smoke; This warning message makes you more concerned about the health risks of smoking; This warning message makes you not want to smoke; Overall, how effective is the warning?). The four items had high internal consistency reliability across adolescent (alpha=0.86) and adult samples (alpha=0.90) and for different warning types (alpha=0.83-0.89), so these were averaged.

Sociodemographic and smoking status

Demographic variables included gender and age group (adolescent=15-18 year, adult=19-65 year). Smoking status was determined from answers to the question: ‘‘In the last 30 days, how often did you smoke cigarettes?’’ Adolescents were classified as smoker only if they answered “every day”, “at least once in a week”, or “at least once in the last month”, while those who answered “not at all” were classified as non-smoker. All adult participants were smokers.

Data Analysis

All analyses were conducted using Stata version 12. Differences in participant characteristics across the health topics (Table 4.1) and textual style conditions (Table 4.2) to which they were randomly assigned were assessed using *t*-tests and chi-square tests. Mean ratings were determined for each warning, examining the distribution of responses. To adjust for correlated data due to repeated measures, linear mixed effects (LME) models were estimated separately for each of the three key outcomes, regressing these outcomes on warning characteristics of interest (i.e., text vs. pictorial; didactic vs. testimonial; differences in PHWL imagery, with suffering as the reference for symbolic

and graphic). Because the perceived effectiveness scale is made up from four items that may assess different behavioral targets, a sensitivity analysis was conducted using each of the four items as the outcome (i.e., prevent young people from starting to smoke, makes you more concerned about the risks of smoking, makes you not want to smoke, and overall effectiveness). In models that included individual item of perceived effectiveness, the results were consistent in their direction, magnitude, and significance with each adjusted model reported in this paper.

Bivariate models were first used to determine main effects of selected warning characteristics on outcomes. After that, adjustment variables (i.e., age group, gender, smoking status, and health topics) were included in each model. Interaction terms between textual type and age group were added into the models assessing textual type. Dummy coded variables of textual type (i.e., testimonial=0 and didactic=1) and age group (i.e., adult=0 and adolescent=1) were multiplied to create the interaction variable. Where interactive effects were significant, models were stratified by age groups.

RESULTS

Sample characteristics

The characteristics of the study sample are shown in Table 4.2, by age group and by condition. Compared to adult smokers, adolescent smokers had a lower percentage of daily smokers, lower scores on the heaviness smoking index (HSI), and higher quit intention. Between the didactic and the testimonial groups, there were no significant differences by sex, age group of participants, educational level, and smoking status, nor were there differences among smokers in their smoking frequency, HSI, and quit intention.

Text-only versus pictorial HWLs

Compared to the text-only warnings, ratings for PHWLs were significantly higher for negative emotional responses (β=1.99, *p*-value<0.001), message credibility (β=1.16, *p*-value<0.001), and perceived effectiveness (β=1.26, *p*-value<0.001) in models adjusting for age, gender, smoking status, textual type, and health topics (Table 4.3).

Imagery types in PHWLs

After adjusting the models for age, gender, smoking status, textual type, and health topics (Table 4.4), compared to suffering imagery, ratings of symbolic imagery were significantly lower for negative emotional responses (β=-0.52, *p*-value<0.001), message credibility (β=-0.55, *p*-value<0.001), and perceived effectiveness (β=-0.38, *p*-value<0.001). On the contrary, graphic imagery were rated significantly higher than suffering imagery for negative emotional responses (β=1.29, *p*-value<0.001), message credibility (β=0.75, *p*-value<0.001), and perceived effectiveness (β=0.84, *p*-value<0.001).

Didactic vs. testimonial text in PHWLs

Compared to PHWLs with testimonial text, ratings of PHWLs with didactic text were not significantly different on any outcome (Table 4.5). Significant interactions were found between textual type and age group for models of message credibility (β=0.51, *p*-value=0.008) and perceived effectiveness (β=0.37, *p*-value=0.048), but not for negative emotional responses (β=0.30, *p*-value=0.095). Further analyses stratifying data by age group revealed that among adolescent, PHWLs with didactic text were perceived as significantly more credible (β=0.314, *p*-value=0.014) and more effective (β=0.329, *p*-value=0.006) than those with testimonials. Among adults, there was no significant

difference between ratings of PHWLs with testimonials and didactic texts (β=-0.188, *p*-value=0.190, and β=-0.04, *p*-value=0.793).

DISCUSSION

Our experimental study among adult smokers and adolescents in Indonesia suggests that PHWLs are more effective than text-only HWLs, as in prior research (Cantrell et al., 2013; Fathelrahman et al., 2010; Hammond, Thrasher, et al., 2012; Huang et al., 2016; McQueen et al., 2015; Nan, Dahlstrom, Richards, & Rangarajan, 2015; Noar, Hall, et al., 2016; Rousu & Thrasher, 2014; Thrasher et al., 2012, 2012; Veer & Rank, 2012), whether assessed for negative emotional responses, message credibility, or perceived effectiveness. Of the three image types commonly used in PHWLs, graphic images produced the highest ratings, followed by suffering images and, thereafter, symbolic images. These results supported the notion that effects of messages may vary depending on the extent to which they contain gruesome content and negative emotion can explain how people react to them (Humphris & Williams, 2014; O'Keefe, 1990; Witte, 1992). These results are also consistent with findings from previous studies across cultural and socioeconomic contexts (Anshari, Yong, et al., n.d.; Berg et al., 2011; Fathelrahman et al., 2010; Gravely et al., 2014; Hammond, Thrasher, et al., 2012; Hammond et al., 2004; Huang et al., 2016; Thrasher et al., 2007, 2010, 2012, 2012; Volchan et al., 2013) suggesting that negative emotional effects of graphic imagery may tap into a relatively universal human response. In other pre-market experimental research before PHWL implementation, which used a similar protocol and measures to those in our study, results were consistent with those found in the general population of smokers after they were exposed to PHWLs (i.e., predictive validity & external validity) (Huang et

al., 2016). Hence, the graphic PHWLs that Indonesia implemented in the year after our study appear likely to have been effective. Nevertheless, further research is needed to determine whether the relatively weak tobacco control environment in Indonesia, particularly allowance for pro-tobacco marketing through most all media channels, has mitigated PHWL effects.

Regarding differences between didactic and testimonial textual strategies in PHWLs, the results did not support hypothesized differences. Previous experimental studies using within-subject designs found mixed results around the effects of textual types in PHWLs (Hammond, Thrasher, et al., 2012; Thrasher et al., 2012). Our study aimed to better assess this dimension by using a between-subject design, which allowed for a more controlled, systematic evaluation of this characteristic of warning content, and had not been used in prior research. Nevertheless, we found that testimonial text was unassociated with any differences in PHWL ratings, except when examining effects by age group. Among adult smokers, there were no differences between textual types on any outcomes, while didactic text seems to work better among adolescents. There are two possible explanations for why adult smokers did not find testimonials more persuasive, the first one is related with the fact that the testimonials that we used were just too short to carry elements of story that can transport the readers into the narrative world. The second is related with the fact that we collected the data before the PHWLs was implemented, thus the novelty of PHWL imagery may have drawn significantly more attention than the text.

Adolescent ratings of PHWLs with didactic text were significantly higher than ratings for those with testimonial text when assessing message credibility and perceived

effectiveness. There are two possible explanation for why this might happen. First is related with the fact that our didactic stimuli used a short instructive phrase (e.g., "Smoking causes lung cancer"), which may be perceived as more personally relevant than testimonial text (e.g., "I am suffering from lung cancer because of smoking") that is associated with older smokers with whom adolescents may not identify. Such identification is particularly important in narrative process as one of the steps to make connection with the characters in the story (Green, 2006). Indeed, empathy appears higher among middle-aged adults than younger adults (O'Brien, Konrath, Grühn, & Hagen, 2013) and youth smokers tended to have "unrealistic optimism" about their ability to quit before they get smoking-related diseases (Weinstein, Slovic, & Gibson, 2004). The second possible explanation comes from a study that found testimonial messages were perceived as more effective when containing affective arguments (i.e., expected feelings toward performing a certain behavior) rather than instrumental arguments (i.e., benefit or loss from doing such behavior) (Keer, van den Putte, de Wit, & Neijens, 2013). In our study, of the eight testimonial messages accompanying PHWLs, only three could be considered to contain affective arguments (e.g., "Smoking makes me impotent. I feel ashamed."), while the rest are instrumental arguments (e.g., "I have had a heart attack because of smoking."). Future research may need to more systematically examine types of testimonial narratives. In the end, to be compelling, testimonial narratives may require more elaboration than is possible on cigarette packages, although the use of complementary media campaigns may help make them more real and credible.

Some limitations to this study lead to cautious interpretation of our findings. First, our study used one-time "forced-exposure" warning stimuli, where participants were

shown the warnings on a computer screen. This approach may not adequately simulate responses to repeated warning exposure in real life settings. However, our study results are largely consistent with previous studies using mock cigarette packs (Thrasher et al., 2012) and those that show the predictive validity of the approach that we used when determining which PHWLs perform best in pre- and post-market studies (Huang et al., 2016). Second, self-reported ratings might produce bias, although we do not expect the bias will be systematic across key areas of inquiry. Previous research has also shown that similar self-reported ratings of PHWLs produced a pattern of results for the type of PHWL imagery we examined that is generally consistent with the pattern of brain activity in visual and emotional processing (Newman-Norlund et al., 2014).

Third, the between subject design for textual condition may be less sensitive for assessing our testimonial manipulation because the large image is very prominent compared to the text, especially when the display size was relatively small (i.e., 40% of cigarette pack). Future research may need to tailor the use of text in brief testimonials to better correspond with the image in PHWL. Lastly, our convenience sample may not be representative of adult smokers and adolescents in Indonesia. Intercept techniques were used to minimize selection bias and obtain a relatively heterogeneous sample. Although Jakarta is the largest city and Bogor is the largest district in Indonesia, they do not represent all the heterogeneous Indonesia population. To study generalizability, further research in rural areas with people who speak Bahasa Indonesia as their second language or at different level of literacy is recommended. Nevertheless, our approach, which relies on purposive, convenience samples, has been shown to have external validity in another LMIC (Mexico) (Huang et al., 2016).

Overall, this study provides the first evidence of which we are aware that a similar pattern of responses applies to lower-middle-income countries, like Indonesia. Hence, our findings add further support for the FCTC recommendations to adopt PHWLs in all countries, with possibilities that they may be particularly effective where rates of illiteracy and low literacy are high (Cunningham, 2009; Thrasher et al., 2012). Another potential benefit to PHWLs in Indonesia stems from the diversity of its population, where more than 700 ethnic languages are used across the archipelago. PHWLs then may overcome linguistic barriers from using textual information only in the national language. This study also suggests that PHWLs with didactic text and graphic imagery are likely to have the greatest impact among Indonesian adult smokers and adolescents. Although perceptions of warnings differ in terms of textual types, but the difference is not substantial.

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Table 4.1. Sample characteristics by health topics

Characteristic	Health topics								chi^2
	Impotence	Death	Addiction	SHS	Lung cancer	Heart disease	Throat cancer	Mouth cancer	
Gender									
Female	18%	21%	22%	21%	20%	19%	19%	21%	
Male	82%	79%	78%	79%	80%	81%	81%	79%	p=0.074
Age group									
Adult	56%	48%	47%	51%	51%	47%	47%	50%	
Adolescent	44%	52%	53%	49%	49%	53%	53%	50%	p<0.001
Smoking status									
Non-smoker	25%	26%	26%	25%	29%	26%	27%	28%	
Smoker	75%	74%	74%	75%	71%	74%	73%	72%	p=0.246

Table 4.2. Sample characteristics by age group and textual condition

Sample Characteristic	Age Group			Textual Condition		
	Adult % (n)	*Adolescent* % (n)	*Diff.* chi^2/*t*-test	*Testimonial* % (n)	*Didactic* % (n)	*Diff.* chi^2/*t*-test
Gender						
Male	85% (497)	75% (443)		79% (475)	80% (465)	
Female	15% (87)	25% (150)	p<0.001	21% (123)	20% (114)	p=0.707
Age						
Mean (SD)	32 (10)	16 (0.9)	p<0.001	n/a	n/a	
Adult (19-64)	n/a	n/a		49% (292)	50% (292)	
Adolescent (15-18)	n/a	n/a		51% (306)	50% (287)	p=0.583
Education level						
Low (some high school or lower)	18% (107)	99% (585)		59% (352)	59% (340)	
Moderate (completed high school)	73% (422)	1% (7)		37% (222)	36% (207)	
High (some college and above)	9% (50)	0% (0)	p<0.001	4% (22)	5% (25)	p=0.564
Smoking status						
Smoker	100% (584)	47% (280)		71% (426)	76% (436)	
Non-smoker	0	53% (313)	p<0.001	29% (172)	24% (141)	p=0.087
SMOKERS						
Smoking frequency						
Daily	92% (536)	59% (165)		82% (349)	80% (351)	
Weekly	7% (41)	33% (92)		16% (66)	15% (65)	
Monthly	1% (7)	8% (23)	p<0.001	2% (10)	5% (20)	p=0.201
Heaviness of Smoking Index						
Mean (SD)	2.04 (1.64)	0.63 (1.10)	p<0.001	1.62 (0.08)	1.56 (0.08)	p=0.63
Quit intentions within 6 months						
No	71% (416)	55% (155)		66% (279)	67% (292)	
Yes	29% (167)	45% (125)	p<0.001	34 (146)	33% (146)	p=0.752

Table 4.3. Effects of warning types on outcomes

	Outcomes, Coef. (SE)					
	Negative Emotional Responses		**Message Credibility**		**Perceived Effectiveness**	
	Bivariate	*Adjusted*	*Bivariate*	*Adjusted*	*Bivariate*	*Adjusted*
Warning types						
Text only	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
PHWL	1.96 (0.04)***	1.99 (0.04)***	1.15 (0.04)***	1.16 (0.04)***	1.24 (0.04)***	1.26 (0.03)***

Note: Adjusted models included these variables: age group, sex, smoking status, textual types, and health topics.
* p<0.05 ** p<0.01 *** p<0.001

Table 4.4. Effects of PHWL imagery types on outcomes

	Outcomes, Coef. (SE)					
	Negative Emotional Responses		**Message Credibility**		**Perceived Effectiveness**	
	Bivariate	*Adjusted*	*Bivariate*	*Adjusted*	*Bivariate*	*Adjusted*
Imagery types						
Suffering	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Symbolic	-0.58 (0.04)***	-0.52 (0.05)***	-0.64 (0.05)***	-0.55 (0.05)***	-0.45 (0.04)***	-0.38 (0.04)***
Graphic	1.65 (0.04)***	1.29 (0.06)***	0.96 (0.05)***	0.75 (0.06)***	1.14 (0.04)***	0.84 (0.05)***

Note: Adjusted models included these variables: age group, sex, smoking status, textual types, and health topics.
* p<0.05 ** p<0.01 *** p<0.001

Table 4.5. Effects of textual types of PHWLs on outcomes

	Negative Emotional Responses			Message Credibility			Perceived Effectiveness		
	Bivariate *Coef. (SE)*	Adj. 1 *Coef. (SE)*	Adj. 2 *Coef. (SE)*	Bivariate *Coef. (SE)*	Adj. 1 *Coef. (SE)*	Adj. 2 *Coef. (SE)*	Bivariate *Coef. (SE)*	Adj. 1 *Coef. (SE)*	Adj. 2 *Coef. (SE)*
Textual types									
Testimonial	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Didactic	0.08	0.04	-0.11	0.08	0.06	-0.20	0.14	0.14	-0.05
	(0.09)	(0.09)	(0.13)	(0.10)	(0.10)	(0.14)	(0.10)	(0.09)	(0.13)
Age group									
Adult	n/a	*ref.*	*ref.*	n/a	*ref.*	*ref.*	n/a	*ref.*	*ref.*
Adolescent	n/a	-0.52	-0.67	n/a	-0.39	-0.65	n/a	-0.21	-0.40
		(0.11)	(0.15)		(0.12) **	(0.16)		(0.12)	(0.15) **
		***	***			***			
Interaction									
Text * Age	n/a	n/a	0.30	n/a	n/a	0.51	n/a	n/a	0.37
			(0.18)			(0.19) **			(0.19) *

Note: Adjusted 1 models included these variables: age group, sex, smoking status, warning textual types, and health topics. Adjusted 2 models included interaction between textual types and age group variable. * $p<0.05$ ** $p<0.01$ *** $p<0.001$

Manuscript 2[2]

Differential effects of pictorial health warnings for cigarette packs in Indonesia: Assessing moderation by smoker identity, advertising exposure, self-efficacy, and reactance

ABSTRACT

Background**:** Research is needed on which characteristics of health warning labels (HWLs) are most effective across key population subgroups.

Methods**:** This experimental study employed both between-subject (HWL textual type, i.e., didactic vs testimonial) and within-subject manipulations (HWL image style: no image; graphic; suffering; symbolic), collecting data from Indonesian adult smokers (n=584), and adolescents (n=280 smokers; n=313 nonsmokers). Outcomes included ratings of HWLs for negative emotional responses, message credibility, and perceived effectiveness. Potential moderators included: smoker identity and self-efficacy to quit among smokers; self-reported advertising exposure; and reactance to HWL. Main and interactive effects of HWL manipulations and participant characteristics on outcomes were estimated using linear mixed effects models, with models re-estimated after stratification by moderating variables when significant interactions were detected.

Results**:** Smoker identity was negatively associated with perceived effectiveness with no statistically significant interactions found. Advertising exposure was positively associated with all outcomes and significantly interacted with textual types and image style when assessing message credibility and perceived effectiveness, such that effects of didactic

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HWLs were stronger and differences across HWL image style were greater among those with higher advertising exposure. Self-efficacy was positively associated with all outcomes, and significantly interacted with image style when assessing negative emotional responses, such that differences across HWL image style were greater for smokers with lower self-efficacy than those with higher self-efficacy. Reactance was positively associated with all outcomes, and significantly interacted with image style when assessing negative emotional responses and perceived effectiveness, with greater differences between HWL image style among those with lower reactance than with higher reactance; however, the relative strength of HWL ratings by image style was the same in all stratified analyses.

Conclusion**:** The most effective HWL imagery (suffering, graphic depictions of disease) does not appear to vary across key subpopulations, although HWL effects may be relatively stronger in some subgroups than in others.

INTRODUCTION

Previous studies have shown that pictorial health warning labels (PHWLs) can increase risk perceptions (Hammond et al., 2006; Kennedy et al., 2012; Swayampakala et al., 2015; Thrasher, Pérez-Hernández, et al., 2012a; Thrasher, Pérez-Hernández, Arillo-Santillán, & Barrientos-Gutiérrez, 2012b), quit motivation and cessation behavior (Azagba & Sharaf, 2013; Hammond, 2011; Hammond et al., 2007; Noar, Hall, et al., 2016; Thrasher et al., 2014), including in recent randomized field trials (Brewer et al., 2016; Evans et al., 2015; McQueen et al., 2015). PHWLs with fear-arousing images that show damaged body parts appear more effective than other types of PHWL imagery in observational studies comparing countries that use different PHWL imagery (Thrasher et

al., 2010), longitudinal studies of countries that change PHWL imagery over time (Gravely et al., 2014), and experimental studies (Fong et al., 2010; Hammond, Thrasher, et al., 2012; Malouff, Schutte, Rooke, & MacDonell, 2012; Thrasher, Carpenter, et al., 2012). Nevertheless, some concerns have been raised about potential backfiring of fear arousing, graphic PHWLs, particularly amongst smokers with low self-efficacy to quit (G.-J. Y. Peters, Ruiter, & Kok, 2012; Ruiter & Kok, 2005).

A less well-studied characteristic of PHWLs is the type of textual content, which can be didactic (i.e., presenting factual argument about cause and effect) or testimonial (i.e., presenting information in the form of brief personal stories), although data are mixed on the effectiveness of one over the other (Hammond, Thrasher, et al., 2012; Thrasher et al., 2012). Almost all countries have used didactic texts on their cigarette warnings, including brief explanations of how smoking causes disease; however, a few countries use short testimonials on the personal impact of smoking-related diseases (e.g., Canada and Australia, see tobaccolabels.ca for examples). Some narrative communication research has found testimonials to be more effective for engaging, educating, and persuading the public (Green, 2006; Kreuter et al., 2007). Research is still needed, however, to understand which PHWL characteristics have maximal impacts, including identification of the key subgroups of smokers in which their effects may be mitigated or enhanced.

Smoker Identity

Smokers' responses to PHWLs may be influenced by their commitment to being a smoker, which may be best explained by social psychology theories of self-identity and social identity. Self-identity, or the salient part of a person's self that relates to a

particular behavior (Conner & Armitage, 1998), extends how someone sees him/herself as fulfilling the criteria of a particular social category. Hence, if a person sees him/herself as a smoker, he/she may conform to his/her self-concept (i.e. keep smoking) as a way of making his/her behavior consistent with relevant aspects of self-definition. This contention is also supported by social identity theory, which is the individual's knowledge that he/she belongs to certain social groups together with some emotional and valued significance to the group membership (Tajfel & Turner, 2004).

Smoker identity, or the extent to which individuals self-identify with the social category of smoker (Falomir & Tomei, 2001), is positively associated with smoking frequency (Levinson et al., 2007), smoking escalation amongst youth (Hertel & Mermelstein, 2012), as well as inversely associated with quit intentions (Falomir & Invernizzi, 1999) and quit attempts (Tombor et al., 2013). Moreover, stronger smoker identity has been associated with stronger perceived support of friends for continuing to smoke and decreased effectiveness of anti-tobacco messages on attitudes about refraining from smoking (Falomir & Invernizzi, 1999). Hence, stronger smoker identity might undermine the effects of PHWLs on cigarette packages, especially in Indonesia where tobacco advertising, promotion and sponsorship is still ubiquitous and aims to positively reinforce such identity (National Cancer Institute, 2008). On the other hand, in the long term, PHWL is expected to spoil this identity (Chapman & Freeman, 2008), which makes assessing smoker identity a crucial marker of the denormalisation of smoking. To date, however, studies of the relationship between smoker identity and PHWLs are lacking.

Advertising exposure

Indonesia allows tobacco advertising, promotions and sponsorship, with only minor restrictions (e.g., the size of a cigarette advertisement on a billboard should not exceed 775 square foot) (Government of Indonesia, 2012). Indeed, Indonesia is the only country in the South East Asia region that still allows cigarette advertisements to be aired on TV and radio, and also printed in newspapers, magazines, and on billboards. Although tobacco companies deny that their marketing targets young nonsmokers, internal industry documents reveal an undeniable interest in marketing cigarettes to youth (Cummings et al., 2002), whose smoking behaviors they carefully monitor and promote to ensure the survival of their industry. Accordingly, features of cigarette brands (e.g. use of filters, low tar), packaging (e.g. size, design, and color), and advertising have been developed specifically to attract teenage smokers (Pollay, 2000). For "concerned smokers," brands were designed to appear lighter and healthier by portraying images that convey a sense of wellbeing, harmony with nature, and intelligence. As in the rest of the world, tobacco advertising strategies in Indonesia promote cigarette initiation among non-smoking youth, while assuaging adult smokers' concerns about the health risks of smoking.

Among Indonesian adolescents aged 13-15 who participated in Global Youth Tobacco Survey (GYTS) in 2009, 89.3% of them reported that they had seen advertisements for cigarettes on billboards within the past month and 76.6% had seen advertisements for cigarettes in newspapers or in magazines (WHO, 2015). Among Indonesian adults ages above 15 who participated in Global Adult Tobacco Survey (GYTS) in 2011, 84.6% of them reported that they had seen any cigarette advertisements, sponsorship and promotion within the past month (World Health Organization, 2012a).

Tobacco advertising might undermine the impact of PHWLs because their competing messages promote smoking (Cummings et al., 2002; Ling & Glantz, 2002; Pollay, 2000). Indeed, anti-smoking communication strategies need to consider how to break through the clutter of competing messages about smoking (Levy & Friend, 2000), which threaten to dampen the effects of anti-smoking communications to prevent tobacco use (Wakefield et al., 2003a). Research is needed to assess whether pro-tobacco advertising also moderates responses to PHWLs, as this may provide further evidence for restricting advertising where it is still allowed.

Self-efficacy

Self-efficacy, defined as people's beliefs about their capabilities to exercise control over their own level of functioning and over events that affect their lives (Bandura, 1993), is central to human functioning and to theories of behavior change (Ajzen, 1991; Rosenstock et al., 1988). Indeed, people's beliefs in their capabilities have been shown to be an important predictor of many health promoting behaviors (Basen-Engquist & Parcel, 1992; McAuley, 1992; Shannon et al., 1990; Sullum et al., 2000), including smoking cessation (Baldwin et al., 2006; Ockene et al., 2000; Schuck et al., 2014; Spek et al., 2013). Self-efficacy is associated with cessation maintenance (Ockene et al., 2000), although the directionality of the relationship is not always clear (Gwaltney et al., 2009). However, findings from longitudinal studies showed that reading warning labels with efficacy messages predict stronger self-efficacy beliefs (Thrasher, Swayampakala, Cummings, et al., 2016), and self-efficacy positively predicts thinking about smoking-related harms, forgoing cigarettes, and sustained cessation attempts (Thrasher, Swayampakala, Borland, et al., 2016).

In warning label research using experimental designs, self-efficacy has been studied as an outcome variable (Schneider et al., 2012), mediating variable (Ho, 1992), and moderating variable (Harris et al., 2007; Mays et al., 2014; Romer et al., 2013). Findings from single-exposure experiments on moderation of PHWLs effects by self-efficacy (Harris et al., 2007; Mays et al., 2014; Romer et al., 2013) are generally consistent with the extended parallel process model (EPPM), which posits that the effects of fear arousing messages depend both on the strength of the emotional response to the message and on the efficacy beliefs (Witte, 1994; Witte & Allen, 2000). Accordingly, a message would be accepted when both perceived threat and efficacy beliefs are high, and conversely, message would be rejected when both perceived threat and efficacy beliefs are low. However, recent observational studies have not found evidence of moderation (Thrasher, Swayampakala, Borland, et al., 2016). More research is needed to better understand how self-efficacy influences responses to PHWL ratings.

Reactance

Psychological reactance is the motivational state when individuals perceive that their freedom is threatened and are motivationally aroused to restore their freedom (Brehm & Brehm, 2013). As such, persuasive messages can elicit reactance that compromise message effects. Witte's EPPM explains that when people are more motivated to control their fear, rather than the danger elicited in a message, they will eliminate fear through denial, defensive avoidance, and reactance (Witte, 1992; Witte & Allen, 2000).

In warning label research, evidence for this phenomenon is mixed. Some experimental studies have found that graphic PHWLs promote stronger reactance than

text-only warnings, suggesting that PHWL is counterproductive to tobacco control strategy (Erceg-Hurn & Steed, 2011; LaVoie et al., 2015). Other studies have examined the implications of reactance, finding that it does not necessarily compromise PHWL effects (Blanton et al., 2014; Thrasher, Swayampakala, Borland, et al., 2016). One observational research has even found that affective state reactance towards PHWLs is associated with stronger responses to PHWLs and greater likelihood of trying to quit, suggesting that reactance may be one of a variety of negative emotional responses that could actually promote desired behavior changes (Cho et al., 2016). More research is needed to determine whether reactance compromises or enhances the effectiveness of PHWL.

Objective

This experimental study aimed to explore the influences of social and psychological factors on adult smokers' and adolescents' responses to HWLs with different characteristics. While effects of HWL characteristics on negative emotional responses, message credibility and perceived effectiveness were reported in our other study (Anshari, Thrasher, Davis, Kim, & Hammond, n.d.), for the current study, we assessed effects of smoker identity, advertising exposure, self-efficacy, and reactance on negative emotional responses, message credibility and perceived effectiveness of the HWLs, and whether these social and psychological factors moderate the effects of HWL characteristics (i.e., textual type: didactic and testimonial; and image style: text-only HWLs, symbolic, suffering and graphic PHWLs) on our outcomes of interest. We expect to observe stronger effects of warning characteristics on outcomes among those with lower smoker identity, lower advertising exposure, higher self-efficacy, lower reactance

for models assessing message credibility and perceived effectiveness, and higher reactance for models assessing negative emotional responses.

METHODS

Sample and procedure

Data for this study were collected from face-to-face interviews with Indonesian adult smokers (n=584) and adolescents aged 15-18 years (n=280 smokers; n=313 nonsmokers) that were recruited in Jakarta city and Bogor district equally. Adult smokers' recruitment involved using street intercept techniques in public places (e.g., malls, supermarkets, restaurants, government offices), while adolescent participants were mostly recruited in coordination with their schools. Recruitment involved setting up tables in targeted places and offering incentives of Rp 50,000 (US$6) phone cards. Data were collected from May 28th to June 16th, 2014.

For ease of conducting the randomized experiments, stimuli were shown to participants on an iPad, along with a survey program specifically developed for this study. After participants were screened for eligibility, agreed to participate, and answered brief demographic and smoking-related questions, they were randomly assigned to either the didactic condition or testimonial condition. After that, they were randomly assigned to assess all the HWLs for two out of eight different message topics, with stimuli presented in random order. The study protocol was reviewed and approved by Ethics Review Board of the Faculty of Public Health, Universitas Indonesia.

Study Stimuli

Sixteen sets of health warnings were developed for this study, including warnings that addressed eight distinct health topics, all of which had two different textual strategies

(i.e., didactic or testimonial). Within each of the eight sets of materials on a different health topic (i.e., addiction, heart disease, death, lung cancer, mouth cancer, throat cancer, second hand smoke, impotence), four different styles of imagery were used (i.e., no image/text-only, graphic, suffering, and symbolic) when possible. Each set of warnings for these topics included one subset of 4 to 6 executions with didactic text (including a text-only version) and another identical subset of executions, except that testimonial text was used (Appendix A). Development of stimuli and data collection procedure for this study is reported in more detail elsewhere (Anshari, Thrasher, et al., n.d.).

Measurement

Warning characteristics

Two warning label variables were generated based on their characteristics. The textual type variable was dummy coded ("0"=testimonial, "1"=didactic). Image style variable was coded with "0" for warnings with no image (text-only), "1" for warnings with symbolic imagery with abstract representations of risk or danger (symbolic), "2" for warnings with suffering imagery of the smoker and/or an affected family member (suffering), and "3" for warnings with graphic imagery of diseased/damaged body part (graphic).

Warning ratings

Participants rated each stimulus with potential mediators of health warning impact, including negative emotional responses, message credibility, and perceived effectiveness, that have been used in other studies (Hammond, Thrasher, et al., 2012; Noar, Hall, et al., 2016; Thrasher et al., 2012, 2012). Participants were asked to rate each

warning using a 1- to 10-response scale with verbal anchors at both ends (i.e., “not at all” and “extremely”). Negative emotional responses, defined as negative emotional reactions to the warning, was measured from three affective responses (i.e., This warning message is disgusting, frightening, unpleasant) that had good internal consistency across conditions (alpha=0.88-0.90) and across image styles (alpha=0.82-0.89), and so these were averaged. Message credibility, defined as perception of truthfulness or believability of the warning messages, was measured by one item (i.e., This warning message is believable). Perceived effectiveness, defined as perception about the effectiveness of warning messages in motivating participants or others to not smoking, was measured by four cognitive responses (i.e., This warning message would help prevent young people from starting to smoke, makes you more concerned about the health risks of smoking, makes you not want to smoke, and overall, how effective is the warning?) that had high internal consistency across conditions (alpha=0.86-0.90) and across image styles (alpha=0.83-0.89), and so these were averaged.

Social psychological factors

Smoker identity was assessed with three Likert-scale items selected from other studies (Falomir & Invernizzi, 1999; Hertel & Mermelstein, 2012; Tracy et al., 2012): “How much is being a smoker part of who you are?” (1=’not at all’ to 5=’a lot’); “To what extent do your friends see you as a real smoker?” (1=’not at all’ to 5=’a lot’); “How important are cigarettes in your life?” (1=’not at all important’ to 5=’the most important’). As internal consistency was adequate (alpha=0.70), responses were averaged with higher scores reflecting a stronger smoker identity.

Advertising exposure was assessed with four items adopted from previous studies (Centers for Disease Control and Prevention, 2011; Weiss et al., 2006). Participants were asked how often in the past 30-days participants had seen cigarette advertisements… 1) when watching TV; 2) when reading newspapers or magazines; 3) on a billboard; and 4) when visiting a convenience store or market. Response options ranged from 1 (never) to 5 (very often) and were averaged to create an index.

Two items were used to measure participants' efficacy beliefs for quitting smoking. The first item was adapted from previous studies (Harris et al., 2007; Lipkus & Shepperd, 2009): "Overall, how confident are you that you can stop smoking altogether right now?"; while the second item was adopted from another study (Fathelrahman et al., 2009): "How confident are you that you can completely avoid smoking in the future?" Response options for both ranged from 1 (not at all) to 5 (completely confident). This measure of self-efficacy yielded adequate internal consistency (alpha=0.63), and the responses were averaged.

After rating warnings, participants were asked questions to assess two domains of reactance: perceived threat to freedom (i.e., Health warnings on cigarette packages try to make a decision for me, try to pressure me, threaten my freedom to choose, try to manipulate me); and negative feelings (i.e., angry, annoyed, irritated, aggravated) while viewing health warnings on cigarette packs (Dillard & Shen, 2005). Response options ranged from 1 (not at all) to 10 (extremely). Both measures had good internal consistency (alpha=0.79 and 0.85, respectively), and so were averaged (alpha=0.85).

Adjustment variables

Demographic variables included age group (adolescent=15-18 years; adult=19-65 years), sex, and educational level (low=middle school or less; moderate=high school completed; high=any university). Smoking status was queried by asking how often participants had smoked in the prior 30 days. Adult participants were included only if they answered "every day", "at least once in a week", or "at least once in the last month", and have smoked more than 100 cigarettes in their lifetime. Adolescent participants were classified as smoker if they had smoked in the prior month, with others classified as non-smokers.

Quit intention among smokers were assessed by asking ''Are you planning to quit smoking cigarettes: within the next month, within the next 6 months, sometime in the future, or are you not planning to quit?'' Responses were recoded as 0 for the last two options and 1 for the first two options ("within the next month" and "within the next 6 months"), as in other studies (Fathelrahman et al., 2009; Hammond, Thrasher, et al., 2012; Reid et al., 2010; Thrasher, Arillo-Santillán, et al., 2012). Smokers were also asked about their number of cigarettes smoked per day and time to first cigarette on waking to compose the Heaviness of Smoking Index (HSI), which is a good indicator of nicotine dependence (Kozlowski et al., 1994) and a reliable predictor of quitting (Borland et al., 2010). Additionally, smokers were asked about their preferences for cigarette's flavors ("clove", "non-clove", or both), and for cigarette's filter type ("with filter", "without filter" or "no preference"), which were dummy coded.

Data Analysis

All analyses were conducted in Stata version 12.0. Differences between participant characteristics across age groups (adolescent vs. adult) and smoking status were assessed using *t*-tests and chi-square tests. Primary independent variables (i.e., smoker identity, advertising exposure, self-efficacy, and reactance) were regressed on sociodemographics and smoking related variables to determine their association. To estimate the main and interactive effects of warning characteristics and primary independent variables on outcomes, linear mixed effects (LME) models were used to adjust for correlated data due to repeated measures. LME models were estimated separately for each of the three key outcomes (i.e., warning label ratings) and each primary independent variable was included in the model separately. Bivariate and adjusted models were used to determine main effects of selected independent variables on outcomes. Adjustment variables included sociodemographic variables (i.e., age group, gender, educational level) and smoking relevant variables (e.g., smoking status, health topics of HWLs). The analytic sample for models testing smoker identity and self-efficacy involved only smokers, therefore, adjustment variables excluded smoking status but included HSI, quit intention, cigarette flavors, and cigarette's filter type. After that, the moderation hypotheses were tested by re-estimating these adjusted models by entering a multiplicative interaction term for each of the primary independent variables and each of warning characteristics one at a time. Where interactive effects were statistically significant, stratified models were estimated after taking the median value to split the sample by different levels of the primary independent variables.

RESULTS

Sample characteristics

Sample characteristics by age groups and smoking status are presented in Table 4.6. There were more female in the youth (25%) than adult groups (15%) due to lower smoking prevalence among Indonesian women. No significant differences were found between adults and youth in their reactance toward the warning labels or reported exposure to cigarette advertisements. However, compared to adult smokers, youth smokers have lower HSI and weaker smoker identity, but higher quit intentions and higher self-efficacy to quit.

Smoker identity

Among smokers, smoker identity was positively associated with gender (being a male) and HSI, but negatively associated with age group (adolescent), educational level, self-efficacy, quit intention, type of cigarette filter, and cigarette flavor (Appendix F). In bivariate models, smoker identity was negatively associated with perceived effectiveness, but was unassociated with negative emotional responses and message credibility (Table 4.7). In fully adjusted models, the negative association between smoker identity and perceived effectiveness remained statistically significant (β=-0.18, *p*-value=0.006). Interactions between smoker identity and both text type and image style were not statistically significant in any models.

Advertising Exposure

Among all participants, advertising exposure was positively correlated with smoking status, age group (adolescent), educational level, and higher reactance (Appendix F). In bivariate models, self-reported advertising exposure was associated with

greater negative emotional responses, message credibility and perceived effectiveness, and this pattern of results was the same in the adjusted models (Table 4.7). Statistically significant interactions between advertising exposure and both textual type and imagery type were observed when assessing message credibility and perceived effectiveness.

After stratifying the data into low and high exposure groups and re-running the models for message credibility and perceived effectiveness, HWLs with didactic text were rated lower than those with testimonial text in low exposure group, whereas the opposite was true in high exposure group (Table 4.8; Figure 4.1A-1B). Additionally, differences between graphic and suffering imagery were greater amongst those with low exposure than those with high exposure, although the pattern of results with regard to which HWL image style had relatively stronger effects remained the same (Table 4.8; Figure 4.1C-1D).

Self-efficacy

Among smokers, self-efficacy was positively associated with quit intention and cigarette flavor, but negatively associated with gender (being a male), educational level, smoker identity, HSI, and type of cigarette filter (Appendix F). In bivariate models, self-efficacy was positively associated with all outcomes and these relationships remained statistically significant in the adjusted models (Table 4.7). No significant interactions were found between self-efficacy and textual type for any outcome. However, a significant interaction with image style was observed in models for negative emotional responses (β=-0.03, *p*-value=0.048), but not for other outcomes. In stratified models using the median value of self-efficacy, relative differences in ratings of negative emotional responses when comparing symbolic and suffering imagery were greater for

smokers with low self-efficacy than for smokers with high self-efficacy (Table 4.8; Figure 4.1E). Nevertheless, the HWL image styles that produced relatively stronger affective responses were consistent across low and high self-efficacy groups.

Reactance

Among all participants, reactance was positively associated with age group (adolescent), smoking status, and advertising exposure, but negatively associated with gender (male) and educational level (Appendix F). In bivariate models, reactance was positively associated with all outcomes, and these associations remaining statistically significant in the adjusted models (Table 4.7). No significant interactions between reactance and textual type were observed for any outcome. However, significant interactions between reactance and HWL image style were observed when assessing negative emotional responses (β=-0.07, p-value<0.001) and perceived effectiveness (β=-0.02, p-value=0.021). After stratifying the data into low and high reactance groups and re-running the models for negative emotional responses and perceived effectiveness, differences in ratings for symbolic compared to suffering imagery were greater amongst those with low reactance than those with high reactance, although the pattern of results with regard to which HWL image styles had the strongest effects was the same (Table 4.8; Figure 4.1F-4.1G).

DISCUSSION

This study aimed to assess smoking-related social, marketing, and psychological factors for which there is theoretical rationale for moderation of health warning label (HWL) effects. While textual type had no significant main effect on any outcome, across all outcomes, graphic HWLs had the strongest effects, followed by suffering, symbolic,

and the text-only HWLs, which is generally consistent with findings from previous studies (Fong et al., 2010; Gravely et al., 2014; Hammond, Thrasher, et al., 2012; Malouff, Schutte, Rooke, & MacDonell, 2012; Thrasher et al., 2010, 2012). For our primary independent variables, we found mixed support for our hypotheses. No evidence for moderation was found for smoker identity, partial support was found for moderation by self-efficacy, and results pointed in the opposite direction than we hypothesized for advertising and reactance. In all cases where statistically significant interactions were found, the pattern of relationships between the outcome variable and HWL image styles were the same across levels of the moderating variables: Graphic HWLs has the strongest responses on all outcomes, followed by suffering, symbolic, and the text-only HWLs. In general, these results are consistent with the contention that the most effective HWLs include graphic and suffering imagery and that smokers who may be more resistant to quitting do not appear to require different messaging strategies (Cho et al., 2016).

We found limited support for the main effects of smoker identity on negative emotional responses, message credibility and perceived effectiveness of PHWLs and no evidence that the strength of smoker identity moderates the effects of PHWL's characteristics on these outcomes. One possible explanation for this concerns the study design, where participants were exposed to novel stimuli for a short period of time. In the context of a country that has lacked anti-smoking campaigns like Indonesia, these exposures may not threaten participants' sense of smoker identity, but be seen as providing them with new information about the product they consume. As expected, however, HWLs were perceived as significantly less effective among those with relatively stronger smoker identity, which is similar to what has been found for the

effects of anti-tobacco messages on attitudes towards quitting smoking (Falomir & Invernizzi, 1999). Strong smoker identity was also associated with lower self-efficacy, having no quit intention and high HSI, which may help explain why these smokers perceived HWL messages as relatively less effective. These smokers were more likely to be and perceived themselves as more addicted, therefore messages about the harms of smoking might not be viewed as helpful. Importantly, smoker identity was unassociated with either negative emotional responses or message credibility, suggesting that smoker identity should not be a primary consideration when developing content for PHWL in Indonesia. Now, such identity considerations may matter more than when this study was conducted because Indonesians have been exposed to PHWLs since 2014. PHWL may help change the social acceptability of smoking by disrupting the positive marketing messages on cigarette packs with unpleasant imagery of the health consequences of smoking. As cigarette packs "spoil" smokers' identities (Chapman & Freeman, 2008), the effects of smoker identity on responses to PHWLs may change. Future research should consider this issue.

We found evidence that self-reported advertising exposures was positively associated with all outcomes, although these effects were contrary to our expectations and what previous research suggested (Levy & Friend, 2000; Wakefield et al., 2003a; Wakefield, Flay, Nichter, & Giovino, 2003b). This might be due to biased self-report of advertising exposure, as our measures asked participants the frequency of ads that they had seen in past 30 days. In the context of Indonesia, where tobacco advertising is pervasive across media channels, self-reported exposure is unlikely to capture the true frequency of advertising exposure and likely reflects selective attention biases. We did

not ask about responses to ads, and predisposing and reinforcing effects from high exposure to cigarette advertisements (Aitken, Eadie, Hastings, & Haywood, 1991; Wakefield et al., 2003b) might provide deeper understanding of cigarette advertisement effects, including their potential to undermine HWL effects.

We also found that advertising exposure moderated the effects of HWL characteristics on message credibility and perceived effectiveness, although, again, the effects were the opposite of what we hypothesized. This might be due to the inclusion of the text-only HWL as one of the study stimuli. The Indonesian government required cigarette ads to provide 10% of their space or time for HWL and there was only one didactic, text-only HWL before the implementation of PHWL regulation (i.e., "Smoking can cause cancer, heart attack, impotence, and birth defect"). Thus, those who reported higher exposure to cigarette ads might also be attending more familiar with didactic HWLs than those who report less frequent exposure to the ads. This might also explain why those with lowest advertising exposure somehow rated testimonial HWLs more credible and effective than didactic HWLs. For advertising exposure moderating the effects of image styles on message credibility and perceived effectiveness of HWLs, the pattern of results was the same amongst those with low and high advertising exposure - HWL image style had relatively stronger effects among those with high advertising exposure. Nevertheless, more rigorous assessments of advertising exposure, such as those that include objective measures of advertising expenditures over time or across areas (Lovato, Linn, Stead, & Best, 2011), may be necessary to better understand whether cigarette ads moderate the effects of HWL characteristics.

Self-efficacy was positively associated with all outcomes, suggesting that higher self-efficacy is associated with stronger responses to HWLs. This is generally consistent with findings from previous studies (Fathelrahman et al., 2009; Ho, 1992; Thrasher, Swayampakala, Borland, et al., 2016). Amongst hypothesized interactions for the primary independent variables, only self-efficacy was consistent with expectations, moderating the association between image style and negative emotional responses. The pattern of effects with regard to which HWL image style had the strongest effects was the same for smokers with both high and low self-efficacy, but differences between symbolic and text-only HWLs were greater among smokers with high self-efficacy than those with low self-efficacy (Figure 4.1E). Our regression analysis found that low self-efficacy is associated with being male, having only completed high school, no intention to quit, stronger smoker identity and stronger HSI. Along with low-self efficacy, these factors might inhibit negative emotional reactions to a HWLs with more abstract, symbolic representation of risks, which require more effortful processing than suffering and graphic HWL imagery. We did not see moderation of self-efficacy on the relationship between image style with message credibility and perceived effectiveness, and on the relationship between textual type and any outcomes. This might be due to the fact that our study stimuli did not incorporate efficacy messages, although those messages would likely need to enhance self-efficacy to be effective. Future research should consider including efficacy messages as one of HWL characteristics when assessing moderation of self-efficacy.

Our study found reactance to have positive effects on all outcomes. This is contrary to some previous studies that deemed reactance as a maladaptive, fear control

response that implies message rejection (Erceg-Hurn & Steed, 2011; LaVoie et al., 2015; Ruiter, Abraham, & Kok, 2001; Steinhart, Carmon, & Trope, 2013; Witte & Allen, 2000). Our results are more in-line with recent studies that found positive association between reactance and cessation behaviors and no evidence of defensive "boomerang effects" (Blanton et al., 2014; Cho et al., 2016). We did not find support for the moderating effects of reactance on the association between textual type and any outcomes, suggesting that effects of reactance is independent of textual type of HWLs. However, we found that reactance moderated the effects of image style on negative emotional responses and perceived effectiveness, suggesting that differences in ratings of these outcomes were greater among those with low reactance than those with high reactance (Figure 4.1F-4.1G). Nonetheless, hierarchy of rating within HWL image styles was the same across levels of reactance. Further investigation should better clarify how reactance matters for risk perceptions or cessation behaviors over real-time exposures, particularly in environments like Indonesia, where pro-tobacco messaging is pervasive.

Limitations

Several limitations should be recognized when interpreting findings from this study. First, HWL stimuli were shown to participants in a standardized size format on an iPad screen, and were shown only during the interview. This does not simulate naturalistic exposures to HWLs where people are exposed repeatedly to warnings, particularly if they are smokers. However, previous research using a similar protocol (Hammond, Thrasher, et al., 2012) has found mostly consistent results with those that used actual, mocked-up packs with warnings (Thrasher et al., 2012). This protocol also has evidence of external and predictive validity when comparing pre-and post-market

studies of smokers' responses to different types of PHWLs (Huang et al., 2016). Not surprisingly, however, smokers' differential responses to HWLs appear weaker after their release onto the market. The same may apply to our pre-market study, since data in our study were collected before implementation of PHWLs in Indonesia.

Our primary measures relied on self-report and may therefore be biased. We tried to minimize this bias by using validated measures from similar studies, and we conducted cognitive interviews (Willis, 2004) to ensure comprehension and to minimize report bias after translating the questionnaire into Bahasa Indonesia. In the US context, self-reported PHWL efficacy and negative arousal have evidence of validity when examining their association with behavioral outcomes that reflect cigarette demand (Rousu & Thrasher, 2014) and when examining neural biomarkers of affect and executive function (Newman-Norlund et al., 2014). Nevertheless, self-report measures used in our study may influence socially desirable responses from our participants. Lastly, our findings do not generalize to all of Indonesians, since we only collected the data in Jakarta and the Bogor district. Although Jakarta is the biggest and the most diverse city, and Bogor is the most populated district in Indonesia, they both are on Java island. Indonesia comprises over 17,000 islands whose inhabitants are from over 700 ethnic groups. However, our main effects results are generally consistent with those that have been found in other populations around the world, whether for the HWL characteristics (Berg et al., 2011; Fong et al., 2010; Hammond, Thrasher, et al., 2012; Malouff et al., 2012; Thrasher et al., 2012), self-efficacy (Fathelrahman et al., 2009; Ho, 1992; Thrasher, Swayampakala, Borland, et al., 2016), or reactance (Blanton et al., 2014; Cho et al., 2016). Further

research is still needed to understand HWL responses among populations in rural areas and other islands of Indonesia.

Overall, our study suggests that social and psychological factors could be considered when developing HWL on cigarette packs, but that the types of HWL imagery that work best are the same across populations with different social and psychological profiles. HWLs with suffering imagery and graphic depictions of disease appear the most effective to influence smokers, whether they have relatively stronger smoker identity, stronger reactance, or lower self-efficacy to quit. Future research should assess other characteristics of HWLs that can enhance self-efficacy to quit, as this measure may further enhance the effectiveness of these pictorial HWL types.

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Table 4.6. Sample characteristics by age group and smoking status

Characteristics	**Adult** % (n)	**Youth** % (n)
Gender		
Male	85% (497)	75% (443)
Female	15% (87)	25% (150)
Age [Mean (SD)]	32 (10)	16 (0.9)
Educational level		
Low (some high school and below)	18% (105)	91% (539)
Moderate (completed high school)	73% (422)	8% (45)
High (some college and above)	9% (50)	1% (5)
Smoking status		
Smoker	100% (584)	47% (280)
Non-smoker	N/A	53% (313)
Reactance [Mean (SD)]	4.23 (1.99)	4.29 (1.79)
Exposure to cigarette ads [Mean (SD)]	3.13 (0.73)	3.15 (0.64)
SMOKERS	*N=584*	*N=284*
Heaviness of Smoking Index [Mean (SD)]	2.04 (1.64)	0.63 (1.10)
Quit intention within 6 months		
Yes	29% (167)	45% (125)
No	71% (416)	55% (155)
Smoker identity [Mean (SD)]	3.17 (0.99)	2.82 (0.86)
Self-efficacy [Mean (SD)]	2.94 (1.14)	3.31 (1.05)
Clove cigarette smoking		
Clove only	63% (367)	63% (175)
Non-clove only	21% (120)	20% (56)
Both	17% (97)	18% (49)
Filtered cigarette smoking		
Filtered only	75% (440)	89% (248)
Non-filtered only	10% (55)	1% (2)
Both	15% (89)	11% (30)

Notes: All adult participants were smokers; adolescent participants were equally smokers and non-smokers.

Table 4.7. Effects of smoker identity, advertising exposure, self-efficacy, and reactance on outcomes

	Outcomes, Est. (SE)		
	Negative Emotions	**Message Credibility**	**Perceived Effectiveness**
SMOKER IDENTITY			
BIVARIATE			
Smoker identity	-0.08 (0.06)	-0.02 (0.06)	-0.28 (0.06) ***
ADJUSTED			
Smoker identity	-0.05 (0.06)	0.04 (0.07)	-0.18 (0.07) **
Textual style			
Testimonial	*ref*	*ref*	*ref*
Didactic	-0.03 (0.11)	-0.04 (0.12)	0.01 (0.11)
Image style			
No image	*ref*	*ref*	*ref*
Symbolic	0.98 (0.06) ***	0.40 (0.07) ***	0.59 (0.05) ***
Suffering	1.57 (0.06) ***	0.97 (0.06) ***	0.99 (0.05) ***
Graphic	2.85 (0.06) ***	1.74 (0.07) ***	1.91 (0.05) ***
INTERACTION			
Smoker identity x Textual style	-0.06 (0.11)	-0.01 (0.12)	-0.12 (0.12)
Smoker identity x Image style	0.02 (0.02)	0.01 (0.02)	0.00 (0.02)
ADS EXPOSURE			
BIVARIATE			
Ads exposure	0.21 (0.07) **	0.15 (0.08) *	0.19 (0.07) **
ADJUSTED			
Ads exposure	0.29 (0.07) ***	0.21 (0.07) **	0.26 (0.07) ***
Textual style			
Testimonial	*ref*	*ref*	*ref*
Didactic	-0.02 (0.09)	0.03 (0.10)	0.07 (0.10)
Image style			
No image	*ref*	*ref*	*ref*
Symbolic	1.10 (0.05) ***	0.46 (0.06) ***	0.64 (0.04) ***
Suffering	1.66 (0.05) ***	1.03 (0.05) ***	1.04 (0.04) ***
Graphic	3.04 (0.05) ***	1.85 (0.06) ***	1.97 (0.04) ***
INTERACTION			
Ads x Textual style	0.20 (0.14)	0.39 (0.14) **	0.28 (0.14) *
Ads x Image style	0.04 (0.02)	0.07 (0.02) **	0.04 (0.02) *

	Outcomes, Est. (SE)		
	Negative Emotions	**Message Credibility**	**Perceived Effectiveness**
SELF-EFFICACY			
BIVARIATE			
Self-efficacy	0.15 (0.05) **	0.20 (0.05) ***	0.34 (0.05) ***
ADJUSTED			
Self-efficacy	0.13 (0.05) *	0.18 (0.06) **	0.26 (0.06) ***
Textual style			
Testimonial	*ref*	*ref*	*ref*
Didactic	-0.03 (0.11)	-0.03 (0.12)	0.02 (0.11)
Image style			
No image	*ref*	*ref*	*ref*
Symbolic	0.98 (0.06) ***	0.40 (0.07) ***	0.59 (0.05) ***
Suffering	1.57 (0.06) ***	0.97 (0.06) ***	0.99 (0.05) ***
Graphic	2.85 (0.06) ***	1.74 (0.07) ***	1.91 (0.05) ***
INTERACTION			
Self-efficacy x Textual style	0.144 (0.10)	0.08 (0.10)	0.13 (0.10)
Self-efficacy x Image style	-0.03 (0.02) *	0.00 (0.02)	-0.02 (0.01)
REACTANCE			
BIVARIATE			
Reactance	0.20 (0.03) ***	0.16 (0.03) ***	0.27 (003) ***
ADJUSTED			
Reactance	0.20 (0.02) ***	0.17 (0.03) ***	0.29 (0.02) ***
Textual style			
Testimonial	*ref*	*ref*	*ref*
Didactic	-0.01 (0.09)	0.03 (0.10)	0.08 (0.09)
Image style			
No image	*ref*	*ref*	*ref*
Symbolic	1.10 (0.05) ***	0.46 (0.06) ***	0.64 (0.04) ***
Suffering	1.66 (0.05) ***	1.03 (0.05) ***	1.04 (0.04) ***
Graphic	3.04 (0.05) ***	1.85 (0.06) ***	1.98 (0.04) ***
INTERACTION			
Reactance x Textual style	0.06 (0.05)	-0.02 (0.05)	0.03 (0.05)
Reactance x Image style	-0.07 (0.01) ***	-0.02 (0.01)	-0.02 (0.01) *

Note: Smoker identity and self-efficacy models only included smokers, while reactance and ads exposure models included all samples. For all models, adjustment variables included age group, sex, and health topics. For models with only smokers, additional adjustment variables were Heaviness of Smoking Index, quit intention, flavor and type of cigarettes. For models with all samples, additional adjustment variable was smoking status. Coefficients and SEs for the interactions terms are from the interaction models, not from the bivariate nor the adjustment models shown in the table. * $p<0.05$ ** $p<0.01$ *** $p<0.001$

Table 4.8. Estimates of HWL characteristics on outcomes in stratified models

	Outcomes, *Coef.* (*SE*)					
	Negative emotions		**Message Credibility**		**Perceived Effectiveness**	
SELF-EFFICACY	*Low Self-efficacy*	*High Self-efficacy*	*Low Self-efficacy*	*High Self-efficacy*	*Low Self-efficacy*	*High Self-efficacy*
Image style						
No image	*ref*	*ref*	n/a	n/a	n/a	n/a
Symbolic	0.87 (0.08)***	1.12 (0.09)***	n/a	n/a	n/a	n/a
Suffering	1.54 (0.07)***	1.60 (0.08)***	n/a	n/a	n/a	n/a
Graphic	2.84 (0.08)***	2.86 (0.09)***	n/a	n/a	n/a	n/a
REACTANCE	*Low Reactance*	*High Reactance*	*Low Reactance*	*High Reactance*	*Low Reactance*	*High Reactance*
Image style						
No image	*ref*	*ref*	n/a	n/a	*ref*	*ref*
Symbolic	1.24 (0.08)***	0.97 (0.07)***	n/a	n/a	0.63 (0.06)***	0.65 (0.06)***
Suffering	1.91 (0.07)***	1.40 (0.07)***	n/a	n/a	1.14 (0.06)***	0.94 (0.06)***
Graphic	3.38 (0.08)***	2.71 (0.07)***	n/a	n/a	2.06 (0.06)***	1.88 (0.06)***
ADS EXPOSURE	*Low Ads Exposure*	*High Ads Exposure*	*Low Ads Exposure*	*High Ads Exposure*	*Low Ads Exposure*	*High Ads Exposure*
Textual style						
Testimonial	n/a	n/a	*ref*	*ref*	*ref*	*ref*
Didactic	n/a	n/a	-0.10 (0.14)	0.18 (0.14)	-0.04 (0.13)	0.21 (0.13)
Image style						
No image	n/a	n/a	*ref*	*ref*	*ref*	*ref*
Symbolic	n/a	n/a	0.51 (0.08)***	0.41 (0.08)***	0.70 (0.06)***	0.59 (0.06)***
Suffering	n/a	n/a	1.03 (0.07)***	1.03 (0.07)***	1.04 (0.06)***	1.05 (0.06)***
Graphic	n/a	n/a	1.78 (0.08)***	1.91 (0.08)***	1.94 (0.06)***	2.00 (0.06)***

Note: Self-efficacy model only included smokers, while reactance and ads exposure models included both smokers and non-smokers. Smoker identity is not shown since there is no significant interaction with HWL characteristics.
For all models, adjustment variables included age group, sex, and health topics. For self-efficacy models, additional adjustment variables were Heaviness of Smoking Index, quit intention, flavor and type of cigarettes. For reactance and exposure to cigarette advertisements models, additional adjustment variable was smoking status.
n/a = Not applicable
* p<0.05 ** p<0.01 *** p<0.001

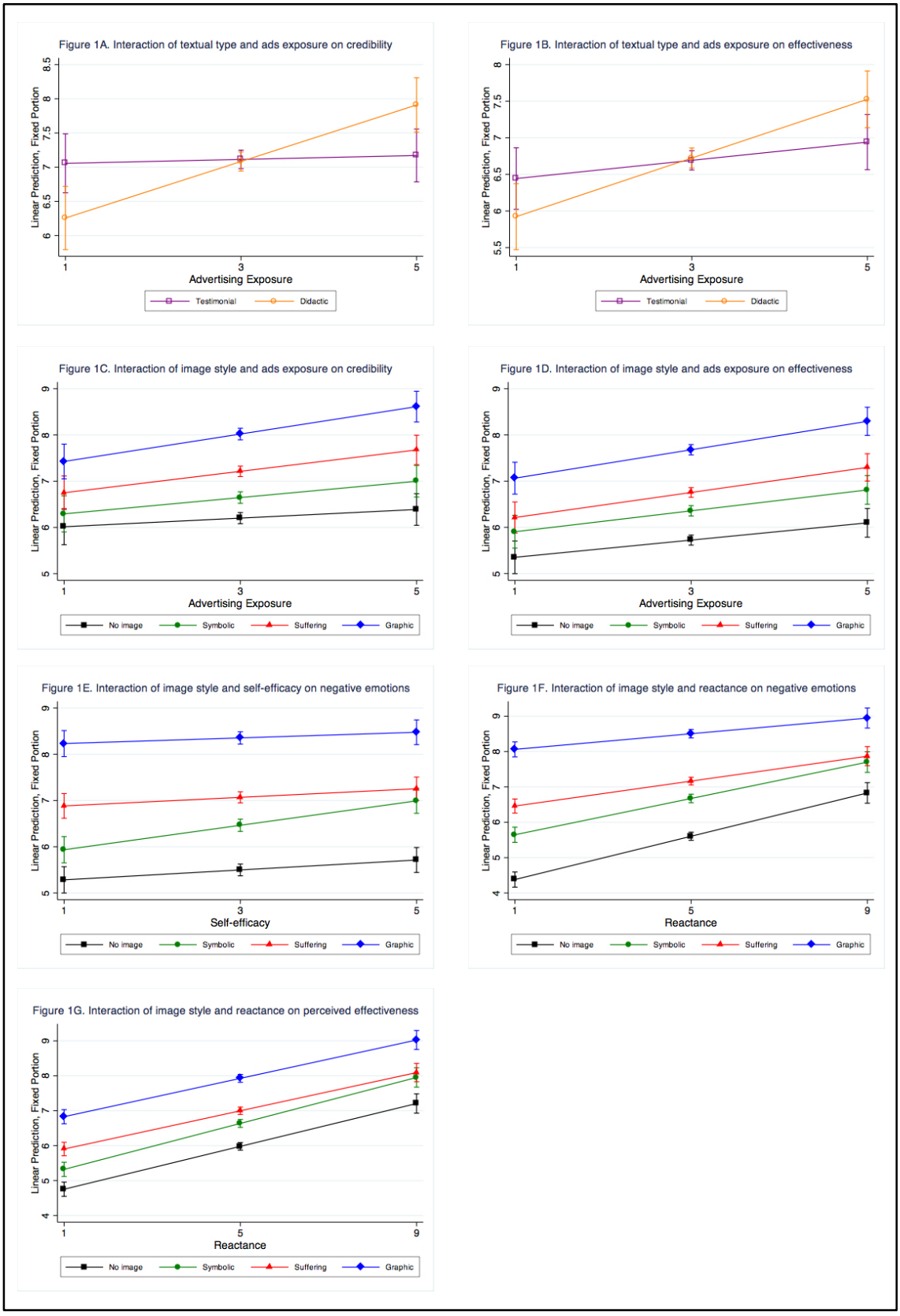

Figure 4.1. Interaction between independent variables and HWL characteristics

CHAPTER 5

SUMMARY, IMPLICATIONS AND RECOMMENDATIONS

The objective of this study is to determine the most effective PHWL content for Indonesia, including similarities and differences with research conducted in other countries. This study is also aimed to assess social and psychological factors that may influence PHWL impacts. The pattern of results from this study indicates that Indonesians respond to PHWLs in ways that are comparable to findings from previous studies in MICs and HICs. In particular, the results indicate that PHWLs work better than the text only warnings, as has been found across social cultural settings (e.g., Cantrell et al., 2013; Fathelrahman et al., 2010; Hammond et al., 2012; McQueen et al., 2015; Nan, Dahlstrom, Richards, & Rangarajan, 2015; Noar et al., 2015; Rousu & Thrasher, 2014; Thrasher et al., 2012; Thrasher et al., 2012; Veer & Rank, 2012; Huang et al, 2016). In terms of PHWL content, PHWLs with graphic imagery evoked the strongest negative emotional responses, were rated as having the highest credibility and were perceived as the most effective, followed by PHWLs with suffering imagery, and, lastly, by PHWLs with symbolic imagery. These results are also consistent with findings from previous studies across cultural and socioeconomic contexts (Anshari et al., n.d.; Berg et al., 2011; Fathelrahman et al., 2010; Gravely et al., 2014; Hammond et al., 2012, 2004; Thrasher et al., 2010, 2007; Thrasher, Arillo-Santillán, et al., 2012; Thrasher, Carpenter, et al., 2012; Huang et al, 2016). In terms of textual type used in the warnings, we used a between-subject design to mitigate some of the design issues that may have led to mixed findings

from previous studies (Hammond, Thrasher, et al., 2012; Thrasher et al., 2012). This design allowed for a more controlled, systematic evaluation of this characteristic of warning content and had not been done in prior research. However, we found no significant difference between the use of didactic text and the use of brief testimonials, except that the didactic text seemed to work better among adolescents.

For the social psychological factors affecting the warning reactions, we found that smoker identity only negatively influence how participants perceived the effectiveness of PHWLs, while advertisings exposure, self-efficacy, and reactance were found to have positive effects on all outcomes. Such positive effects of advertisings exposure and reactance for two outcomes were in the opposite direction than what we expected. As for our moderation hypotheses, we found no support for moderation of smoker identity. Partial support for moderation by self-efficacy were found when examining association between image style and negative emotional responses. Results around moderation pointed in the opposite direction than we hypothesized when examining advertising exposure on message credibility and perceived effectiveness, and when examining reactance on negative emotional responses and perceived effectiveness. It is important to note that the pattern of relationships between the outcome variable and HWL image styles were the same across levels of the moderating variable: Graphic PHWLs has the strongest responses on all outcomes, followed by suffering, symbolic, and the text-only HWLs. Moderation did not change these relationships, but made them more or less evident. In general, our findings are consistent with the opinion that the most effective HWLs include graphic and suffering imagery and that smokers who may be more resistant to quitting do not appear to require different messaging strategies.

Interpretation of our findings should consider some limitations of this study. First, the study design involved a one-time, forced-exposure to our study stimuli, where participants were shown the warnings on a computer screen. This approach may not adequately represent exposure in real life settings, which involves repeated exposure of up to 20 times a day for a pack-a-day smoker. However, our study results are largely consistent with previous studies using mock cigarette packs (Thrasher et al., 2012) and those that show the predictive validity of the approach that we used when determining which PHWLs perform best in pre- and post-market studies (Huang et al., 2016).

Second, self-reported ratings might produce bias, although we do not expect the bias will be systematic across key areas of inquiry. Previous research has also shown that similar self-reported ratings of PHWLs produced a pattern of results for the type of PHWL imagery we examined that is generally consistent with the pattern of brain activity in visual and emotional processing (Newman-Norlund et al., 2014). Third, the use of between subject design for the textual condition may be less sensitive for assessing our testimonial manipulation because the large image is very prominent compared to the text, especially when the display size was relatively small (i.e., 40% of cigarette pack). Short version of testimonial text may need to be carefully tailored to better correspond with the image in PHWL.

Lastly, our convenience sample may not be representative of adult smokers and adolescent in Indonesia. Therefore we used intercept techniques to minimize selection bias and obtain a relatively heterogeneous sample, which has been shown to have external validity (Huang et al., 2016).

Recommendation

Based on our findings, we recommend the use of graphic and suffering imagery for PHWLs as they appear most effective for adult smokers and adolescents. As for the textual strategy, we recommend the use of didactic texts as they appear most effective among adolescents, although the use of testimonials may be more effective for adult smokers. Future research may need to more systematically examine types of testimonials, more carefully tailor the text to better fit with image, and may require more elaboration to make testimonials be more compelling. Furthermore, this type of strategy may become more effective after populations are exposed to PHWLs on packages in real life, and our findings have been considered by the Ministry of Health Republic of Indonesia for the selection of new content for the second rounds of PHWLs in Indonesia.

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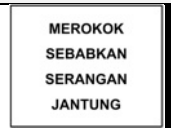
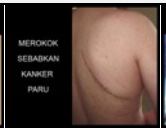
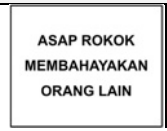
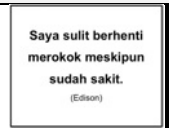
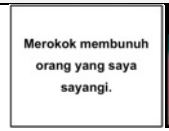
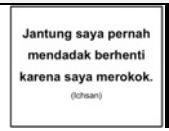
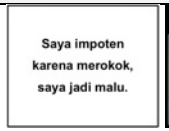
APPENDIX A – MEAN AND (STANDARD ERROR) OF STIMULUS

Condition: DIDACTIC					
Topic: Addiction (n=134)	IDAD1D	IDAD2D	IDAD3D	IDAD4D	IDAD5D
Text: Smoking is a deadly addiction					
Negative emotional responses	5.18 (0.23)	7.45 (0.18)	5.96 (0.21)	6.26 (0.20)	5.52 (0.22)
Message credibility	6.15 (0.24)	7.53 (0.18)	6.08 (0.21)	6.68 (0.22)	6.05 (0.23)
Perceived effectiveness	5.74 (0.21)	7.22 (0.18)	6.12 (0.19)	6.53 (0.19)	6.01 (0.20)
Topic: Death (n=145)	IDDE1D	IDDE2D	IDDE3D	IDDE4D	IDDE5D
Text: Smoking kills					
Negative emotional responses	5.33 (0.22)	6.92 (0.19)	7.02 (0.20)	5.49 (0.21)	6.40 (0.20)
Message credibility	6.22 (0.24)	7.18 (0.21)	7.48 (0.20)	5.90 (0.22)	6.72 (0.22)
Perceived effectiveness	5.65 (0.20)	6.94 (0.18)	7.03 (0.18)	5.70 (0.19)	6.30 (0.19)
Topic: Heart disease (n=156)	IDHD1D	IDHD2D	IDHD3D	IDHD4D	IDHD5D
Text: Smoking causes heart diseases					
Negative emotional responses	5.14 (0.22)	8.03 (0.15)	8.46 (0.14)	8.24 (0.15)	6.91 (0.19)
Message credibility	6.07 (0.24)	7.91 (0.16)	8.34 (0.14)	8.07 (0.18)	7.30 (0.19)
Perceived effectiveness	5.50 (0.21)	7.55 (0.15)	7.95 (0.14)	7.79 (0.15)	6.86 (0.17)
Topic: Impotence (n=150)	IDIM1D	IDIM2D	IDIM3D	IDIM4D	IDIM5D
Text: Smoking causes impotence					
Negative emotional responses	5.32 (0.23)	6.39 (0.21)	7.33 (0.18)	6.58 (0.21)	5.72 (0.22)
Message credibility	5.95 (0.23)	6.41 (0.21)	7.27 (0.19)	6.58 (0.22)	5.99 (0.23)
Perceived effectiveness	5.60 (0.20)	6.15 (0.20)	6.78 (0.17)	6.34 (0.19)	5.81 (0.20)

Topic: Lung cancer (n=142)	IDLC1D	IDLC2D	IDLC3D	IDLC4D	IDLC5D	IDLC6D
Text: Smoking causes lung cancer						
Negative emotional responses	5.33 (0.23)	7.05 (0.19)	8.59 (0.14)	7.04 (0.18)	7.17 (0.18)	8.76 (0.12)
Message credibility	6.34 (0.24)	7.49 (0.19)	8.33 (0.16)	7.21 (0.20)	7.59 (0.19)	8.63 (0.14)
Perceived effectiveness	5.74 (0.21)	6.96 (0.18)	7.96 (0.16)	6.75 (0.18)	6.96 (0.18)	8.15 (0.15)
Topic: Mouth cancer (n=155)	IDMC1D	IDMC2D	IDMC3D	IDMC4D		
Text: Smoking causes mouth cancer						
Negative emotional responses	5.18 (0.22)	9.20 (0.11)	8.98 (0.11)	9.32 (0.09)		
Message credibility	6.19 (0.23)	8.46 (0.16)	8.41 (0.16)	8.62 (0.16)		
Perceived effectiveness	5.65 (0.20)	8.11 (0.15)	8.23 (0.13)	8.44 (0.14)		
Topic: Second hand smoke (n=138)	IDSHS1D	IDSHS2D	IDSHS3D	IDSHS4D	IDSHS5D	IDSHS6D
Text: Cigarette smoke harms other people						
Negative emotional responses	5.34 (0.24)	6.62 (0.20)	6.61 (0.21)	6.22 (0.21)	7.74 (0.17)	6.74 (0.20)
Message credibility	6.25 (0.25)	7.15 (0.20)	7.04 (0.21)	6.46 (0.22)	7.68 (0.19)	7.15 (0.19)
Perceived effectiveness	5.70 (0.21)	6.64 (0.19)	6.46 (0.18)	6.24 (0.19)	6.97 (0.18)	6.51 (0.20)
Topic: Throat cancer (n=138)	IDTC1D	IDTC2D	IDTC3D	IDTC4D	IDTC5D	
Text: Smoking causes throat cancer						
Negative emotional responses	5.42 (0.25)	7.85 (0.17)	8.05 (0.16)	8.93 (0.12)	9.14 (0.11)	
Message credibility	6.14 (0.25)	7.54 (0.18)	7.71 (0.19)	8.03 (0.21)	8.44 (0.18)	
Perceived effectiveness	5.78 (0.23)	7.31 (0.18)	7.52 (0.16)	8.03 (0.15)	8.17 (0.15)	

Condition: TESTIMONIAL					
Topic: Addiction (n=164)	IDAD1T	IDAD2T	IDAD3T	IDAD4T	IDAD5T
Text: I have trouble quitting smoking despite my illness					
Negative emotional responses	4.87 (0.20)	7.84 (0.15)	6.18 (0.20)	6.45 (0.19)	5.95 (0.21)
Message credibility	5.47 (0.21)	7.38 (0.17)	6.60 (0.21)	6.08 (0.21)	6.26 (0.22)
Perceived effectiveness	5.37 (0.19)	7.31 (0.14)	5.97 (0.18)	6.24 (0.18)	5.97 (0.18)
Topic: Death (n=144)	IDDE1T	IDDE2T	IDDE3T	IDDE4T	IDDE5T
Text: Smoking kills the people I love					
Negative emotional responses	5.03 (0.22)	6.75 (0.19)	6.89 (0.20)	5.31 (0.21)	5.89 (0.22)
Message credibility	6.15 (0.23)	7.35 (0.19)	7.24 (0.20)	5.46 (0.23)	6.35 (0.23)
Perceived effectiveness	5.48 (0.20)	6.70 (0.18)	6.57 (0.18)	5.51 (0.19)	5.68 (0.20)
Topic: Heart disease (n=150)	IDHD1T	IDHD2T	IDHD3T	IDHD4T	IDHD5T
Text: I have had a heart attack because of smoking					
Negative emotional responses	5.56 (0.22)	7.88 (0.17)	8.36 (0.15)	8.15 (0.16)	6.71 (0.19)
Message credibility	6.30 (0.24)	7.72 (0.19)	8.15 (0.16)	8.08 (0.16)	7.18 (0.20)
Perceived effectiveness	6.02 (0.20)	7.36 (0.16)	7.65 (0.15)	7.51 (0.15)	6.69 (0.17)
Topic: Impotence (n=161)	IDIM1T	IDIM2T	IDIM3T	IDIM4T	IDIM5T
Text: Smoking makes me impotence, I feel ashamed					
Negative emotional responses	5.69 (0.22)	6.12 (0.21)	7.34 (0.18)	6.36 (0.20)	6.23 (0.21)
Message credibility	6.27 (0.23)	6.33 (0.23)	7.19 (0.20)	6.68 (0.20)	6.48 (0.22)
Perceived effectiveness	5.90 (0.19)	5.95 (0.19)	6.96 (0.17)	6.31 (0.18)	6.19 (0.18)

Topic: Lung cancer (n=141)	IDLC1T	IDLC2T	IDLC3T	IDLC4T	IDLC5T	IDLC6T
Text: I am suffering from lung cancer because of smoking						
Negative emotional responses	5.39 (0.23)	6.82 (0.21)	8.71 (0.13)	7.18 (0.19)	7.07 (0.20)	8.67 (0.14)
Message credibility	6.59 (0.24)	7.51 (0.20)	8.42 (0.14)	7.26 (0.21)	7.44 (0.19)	8.52 (0.16)
Perceived effectiveness	5.92 (0.20)	6.89 (0.17)	7.82 (0.13)	6.71 (0.18)	6.76 (0.18)	7.96 (0.13)
Topic: Mouth cancer (n=143)	IDMC1T	IDMC2T	IDMC3T	IDMC4T		
Text: I have frightening mouth cancer because of smoking						
Negative emotional responses	6.43 (0.23)	8.74 (0.12)	9.00 (0.11)	9.20 (0.10)		
Message credibility	6.59 (0.24)	8.07 (0.17)	8.35 (0.15)	8.48 (0.17)		
Perceived effectiveness	6.28 (0.20)	7.80 (0.17)	7.98 (0.15)	8.24 (0.15)		
Topic: Second hand smoke (n=150)	IDSHS1T	IDSHS2T	IDSHS3T	IDSHS4T	IDSHS5T	IDSHS6T
Text: The smoke from your cigarette hurts me too						
Negative emotional responses	5.24 (0.21)	6.45 (0.20)	6.65 (0.18)	6.26 (0.21)	7.62 (0.17)	6.80 (0.18)
Message credibility	6.25 (0.23)	7.25 (0.20)	7.10 (0.19)	6.19 (0.24)	7.95 (0.19)	7.32 (0.20)
Perceived effectiveness	5.74 (0.19)	6.57 (0.18)	6.61 (0.16)	6.19 (0.18)	6.99 (0.14)	6.52 (0.16)
Topic: Throat cancer (n=143)	IDTC1T	IDTC2T	IDTC3T	IDTC4T	IDTC5T	
Text: I have throat cancer because of smoking. It's painful and miserable.						
Negative emotional responses	5.86 (0.21)	7.69 (0.16)	8.21 (0.14)	8.95 (0.12)	8.95 (0.12)	
Message credibility	6.55 (0.22)	7.59 (0.19)	7.67 (0.17)	8.11 (0.18)	8.32 (0.16)	
Perceived effectiveness	6.15 (0.19)	7.40 (0.15)	7.56 (0.14)	8.12 (0.15)	8.14 (0.14)	

APPENDIX B - SENSITIVITY ANALYSIS RESULTS ON PERCEIVED EFFECTIVENESS

	Perceived effectiveness β (SE)	**Items that made up perceived effectiveness variable,** β (SE)			
		Prevent youth to smoke	Makes you more concern	Makes you not want to smoke	Overall effectiveness
HYPOTHESIS 1					
Warning types					
Text only	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
PHWL	1.26 (0.03)***	1.23 (0.04)***	1.19 (0.04)***	1.10 (0.04)***	1.50 (0.04)***
HYPOTHESIS 2					
Pictorial types					
Suffering	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Symbolic	-0.38 (0.04)***	-0.34 (0.05)***	-0.35 (0.05)***	-0.36 (0.05)***	-0.45 (0.05)***
Graphic	0.84 (0.05)***	0.94 (0.07)***	0.75 (0.06)***	0.71 (0.06)***	0.98 (0.06)***
HYPOTHESIS 3					
Textual types					
Testimonial	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Didactic	-0.05 (0.13)	0.05 (0.16)	-0.07 (0.14)	-0.01 (0.16)	-0.17 (0.14)
Age group					
Adult	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Adolescent	-0.40 (0.15) **	-0.29 (0.18)	-0.41 (0.16)*	-0.29 (0.19)	-0.61 (0.16)***
Interaction					
Text * Age	0.37 (0.19) *	0.32 (0.23)	0.32 (0.20)	0.29 (0.23)	0.56 (0.19)**

Note: Models for hypotheses 1 and 2 are adjusted for age group, sex, smoking status, textual types, and health topics.
Models for hypotheses 3 are adjusted for sex, smoking status, pictorial types, and health topics.
* $p<0.05$ ** $p<0.01$ *** $p<0.001$

	Perceived Effectiveness β (SE)	**Items that made up perceived effectiveness variable,** β (SE)			
		Prevent youth to smoke	Makes you more concern	Makes you not want to smoke	Overall effectiveness
HYPOTHESIS 4					
Smoker identity	-0.18 (0.07) **	-0.15 (0.08) *	-0.12 (0.07)	-0.33 (0.08) ***	-0.12 (0.07)
Interaction					
Smoker identity x Text	-0.12 (0.12)	-0.17 (0.14)	-0.10 (0.13)	-0.08 (0.14)	-0.07 (0.09)
Smoker identity x Image	0.00 (0.02)	0.00 (0.02)	-0.01 (0.02)	0.00 (0.02)	0.00 (0.02)
HYPOTHESIS 5					
Ads exposure	0.26 (0.07) ***	0.15 (0.08)	0.30 (0.08) ***	0.30 (0.09) ***	0.27 (0.07) ***
Interaction					
Ads exposure x Text	0.28 (0.14) *	0.19 (0.17)	0.33 (0.15) *	0.33 (0.17)	0.26 (0.15)
Ads exposure x Image	0.04 (0.02) *	0.05 (0.02) *	0.05 (0.02) *	0.04 (0.02)	0.02 (0.02)
HYPOTHESIS 6					
Self-efficacy	0.26 (0.06) ***	0.11 (0.07)	0.29 (0.06) ***	0.42 (0.06) ***	0.21 (0.06) ***
Interaction					
Self-efficacy x Text	0.13 (0.10)	0.13 (0.12)	0.16 (0.11)	0.14 (0.12)	0.08 (0.11)
Self-efficacy x Image	-0.02 (0.01)	0.00 (0.02)	-0.02 (0.02)	-0.01 (0.02)	-0.03 (0.02)
HYPOTHESIS 7					
Reactance	0.29 (0.02) ***	0.34 (0.03) ***	0.26 (0.03) ***	0.33 (0.03) ***	0.24 (0.03) ***
Interaction					
Reactance x Text	0.03 (0.05)	0.02 (0.06)	0.02 (0.05)	0.03 (0.06)	0.04 (0.05)
Reactance x Image	-0.02 (0.01) *	-0.01 (0.01)	-0.02 (0.01) *	0.00 (0.01)	-0.03 (0.01) ***

Note: For all models, adjustment variables included textual types, pictorial types, age group, gender, and health topics. Models for hypotheses 4 and 6 only included smokers, while hypotheses 5 and 7 included all samples. For models with only smokers, additional adjustment variables were Heaviness of Smoking Index, quit intention, flavor and type of cigarettes. For models with all samples, additional adjustment variable was smoking status. Coefficients and SEs for the interactions terms are from separate interaction models. *p<0.05 **p<0.01 ***p<0.001

APPENDIX C – EFFECTS OF WARNING TYPES ON OUTCOMES

	Negative emotions	Message credibility	Perceived effectiveness
Variable	*Coef. (SE)*	*Coef. (SE)*	*Coef. (SE)*
BIVARIATE			
Warning types			
Text-only	Ref.	Ref.	Ref.
Pictorial HWL	1.96 (0.04) ***	1.15 (0.05) ***	1.24 (0.04) ***
ADJUSTED			
Warning types			
Text-only	Ref.	Ref.	Ref.
Pictorial HWL	1.99 (0.04) ***	1.16 (0.04) ***	1.26 (0.03) ***
Text types			
Testimonial	Ref.	Ref.	Ref.
Didactic	-0.02 (0.09)	0.03 (0.10)	0.08 (0.10)
Age group			
Adult	Ref.	Ref.	Ref.
Adolescent	-0.62 (0.12) ***	-0.49 (0.12) ***	-0.32 (0.12) **
Gender			
Female	Ref.	Ref.	Ref.
Male	-0.61 (0.12) ***	-0.44 (0.13) **	-0.55 (0.13) ***
Smoking status			
Non-smokers	Ref.	Ref.	Ref.
Smokers	-0.12 (0.14)	-0.38 (0.15) *	-0.62 (0.14) ***
Health topic			
Impotence	Ref.	Ref.	Ref.
Death	-0.09 (0.08)	0.17 (0.09) *	0.08 (0.07)
Addiction	-0.03 (0.08)	-0.03 (0.09)	0.03 (0.07)
SHS	0.08 (0.08)	0.40 (0.09) ***	0.10 (0.07)
Lung cancer	0.95 (0.08) ***	1.04 (0.09) ***	0.81 (0.07) ***
Heart disease	1.14 (0.08) ***	1.02 (0.09) ***	0.96 (0.07) ***
Throat cancer	1.66 (0.08) ***	1.12 (0.09) ***	1.23 (0.07) ***
Mouth cancer	1.91 (0.09) ***	1.34 (0.09) ***	1.38 (0.07) ***

* p-value<0.05 ** p-value<0.01 *** p-value<0.001

APPENDIX D – EFFECTS OF PHWL IMAGERY TYPE ON OUTCOMES

	Negative emotions	Message credibility	Perceived effectiveness
Variable	*Coef. (SE)*	*Coef. (SE)*	*Coef. (SE)*
BIVARIATE			
Image type			
Suffering	Ref.	Ref.	Ref.
Symbolic	-0.58 (0.04) ***	-0.64 (0.05) ***	-0.45 (0.04) ***
Graphic	1.65 (0.04) ***	0.96 (0.05) ***	1.14 (0.04) ***
ADJUSTED			
Image type			
Suffering	Ref.	Ref.	Ref.
Symbolic	-0.52 (0.05) ***	-0.55 (0.05) ***	-0.38 (0.04) ***
Graphic	1.29 (0.06) ***	0.75 (0.06) ***	0.84 (0.05) ***
Text types			
Testimonial	Ref.	Ref.	Ref.
Didactic	0.04 (0.09)	0.06 (0.10)	0.14 (0.09)
Age group			
Adult	Ref.	Ref.	Ref.
Adolescent	-0.52 (0.11) ***	-0.39 (0.12) **	-0.21 (0.12)
Gender			
Female	Ref.	Ref.	Ref.
Male	-0.54 (0.12) ***	-0.43 (0.13) **	-0.51 (0.13) ***
Smoking status			
Non-smokers	Ref.	Ref.	Ref.
Smokers	-0.167	-0.37 (0.14) *	-0.61 (0.14) ***
Health topic			
Impotence	Ref.	Ref.	Ref.
Death	-0.19 (0.08) *	0.05 (0.09)	0.03 (007)
Addiction	-0.10 (0.08)	-0.13 (0.09)	-0.04 (0.07)
SHS	-0.10 (0.09)	0.16 (0.09)	-0.03 (0.07)
Lung cancer	0.40 (0.09) ***	0.60 (0.10) ***	0.43 (0.07) ***
Heart disease	0.05 (0.10)	0.26 (0.11) *	0.27 (0.08) **
Throat cancer	0.69 (0.10) ***	0.35 (0.11) **	0.59 (0.09) ***
Mouth cancer	0.75 (0.11) ***	0.54 (0.12) ***	0.61 (0.09) ***

* p-value<0.05 ** p-value<0.01 *** p-value<0.001

APPENDIX E - TESTIMONIALS VERSUS DIDACTIC TEXTS

	Negative emotions	Message credibility	Perceived effectiveness
Variable	*Coef. (SE)*	*Coef. (SE)*	*Coef. (SE)*
MODEL 1: BIVARIATE			
Text types			
Testimonial	Ref.	Ref.	Ref.
Didactic	0.08 (0.10)	0.08 (0.10)	0.14 (0.10)
MODEL 2: ADJUSTED			
Text types			
Testimonial	Ref.	Ref.	Ref.
Didactic	0.04 (0.09)	0.06 (0.10)	0.14 (0.09)
Image type			
Suffering	Ref.	Ref.	Ref.
Symbolic	-0.52 (0.05) ***	-0.55 (0.05) ***	-0.38 (0.04) ***
Graphic	1.29 (0.06) ***	0.75 (0.06) ***	0.84 (0.05) ***
Age group			
Adult	Ref.	Ref.	Ref.
Adolescent	-0.52 (0.11) ***	-0.39 (0.12) **	-0.21 (0.12)
Gender			
Female	Ref.	Ref.	Ref.
Male	-0.54 (0.12) ***	-0.43 (0.13) **	-0.51 (0.13) ***
Smoking status			
Non-smokers	Ref.	Ref.	Ref.
Smokers	-0.17 (0.14)	-0.37 (0.14) *	-0.61 (0.14) ***
Health topic			
Impotence	Ref.	Ref.	Ref.
Death	-0.19 (0.08) *	0.05 (0.09)	0.03 (0.07)
Addiction	-0.10 (0.08)	-0.13 (0.09)	-0.04 (0.07)
SHS	-0.10 (0.09)	0.16 (0.09)	-0.03 (0.07)
Lung cancer	0.41 (0.09) ***	0.60 (0.10) ***	0.43 (0.07) ***
Heart disease	0.05 (0.10)	0.26 (0.11) *	0.27 (0.08) **
Throat cancer	0.69 (0.10) ***	0.35 (0.11) **	0.59 (0.09) ***
Mouth cancer	0.75 (0.11) ***	0.54 (0.12) ***	0.61 (0.09) ***

	Negative emotions	Message credibility	Perceived effectiveness
	Coef. (SE)	*Coef. (SE)*	*Coef. (SE)*
MODEL 3: INTERACTION			
Text types			
Testimonial	Ref.	Ref.	Ref.
Didactic	-0.11 (0.13)	-0.20 (0.14)	-0.05 (0.13)
Age group			
Adult	Ref.	Ref.	Ref.
Adolescent	-0.67 (0.15) ***	-0.65 (0.16) ***	-0.40 (0.15) **
Text type * age group	0.30 (0.18)	0.51 (0.19) **	0.37 (0.19) *
Image type			
Suffering	Ref.	Ref.	Ref.
Symbolic	-0.52 (0.05) ***	-0.55 (0.05) ***	-0.38 (0.04) ***
Graphic	1.29 (0.06) ***	0.75 (0.06) ***	0.84 (0.05) ***
Gender			
Female	Ref.	Ref.	Ref.
Male	-0.53 (0.12) ***	-0.42 (0.13) **	-0.50 (0.13) ***
Smoking status			
Non-smokers	Ref.	Ref.	Ref.
Smokers	-0.18 (0.14)	-0.40 (0.14) **	-0.62 (0.14) ***
Health topic			
Impotence	Ref.	Ref.	Ref.
Death	-0.20 (0.08) *	0.04 (0.09)	0.03 (0.07)
Addiction	-0.10 (0.08)	-0.13 (0.09)	-0.04 (0.07)
SHS	-0.10 (0.09)	0.16 (0.09)	-0.03 (0.07)
Lung cancer	0.41 (0.09) ***	0.60 (0.10) ***	0.43 (0.07) ***
Heart disease	0.05 (0.10)	0.26 (0.11) *	0.27 (0.08) **
Throat cancer	0.69 (010) ***	0.36 (0.11) **	0.59 (0.09) ***
Mouth cancer	0.75 (0.11) ***	0.54 (0.12) ***	0.61 (0.09) ***

* p-value<0.05 ** p-value<0.01 *** p-value<0.001

MODEL 4: STRATIFIED BY AGE GROUP, Coef. (SE)				
	Message credibility		Perceived effectiveness	
Variable	*Adults*	*Adolescents*	*Adults*	*Adolescents*
Text types				
Testimonial	Ref.	Ref.	Ref.	Ref.
Didactic	-0.19 (0.14)	0.31 (0.13)*	-0.04 (0.14)	0.33 (0.12)**
Image type				
Suffering	Ref.	Ref.	Ref.	Ref.
Symbolic	-0.52 (0.07)***	-0.59 (0.07)***	-0.32 (0.06)***	-0.44 (0.05)***
Graphic	0.62 (0.09)***	0.87 (0.09)***	0.72 (0.07)***	0.96 (0.07)***
Gender				
Female	Ref.	Ref.	Ref.	Ref.
Male	-0.53 (0.20)**	-0.32 (0.16)	-0.76 (0.20)***	-0.28 (0.15)
Smoking status				
Non-smokers	N/A	Ref.	N/A	Ref.
Smokers	N/A	-0.43 (0.14)**	N/A	-0.70 (0.13)***
Health topic				
Impotence	Ref.	Ref.	Ref.	Ref.
Death	0.06 (0.13)	0.03 (0.13)	0.16 (0.10)	-0.12 (0.10)
Addiction	-0.08 (0.13)	-0.18 (0.13)	0.10 (0.10)	-0.19 (0.10)
SHS	0.25 (0.13)*	0.06 (0.14)	0.13 (0.10)	-0.21 (0.10)*
Lung cancer	0.68 (0.13)***	0.51 (0.14)***	0.58 (0.10)***	0.26 (0.11)*
Heart disease	0.40 (0.15)**	0.09 (0.15)	0.47 (0.12)***	0.04 (0.11)
Throat cancer	0.37 (0.15)*	0.32 (0.16)*	0.67 (0.12)***	0.48 (0.12)***
Mouth cancer	0.43 (0.16)**	0.65 (0.17)***	0.65 (0.13)***	0.56 (0.13)***

* p-value<0.05 ** p-value<0.01 *** p-value<0.001

APPENDIX F – PREDICTORS OF SMOKER IDENTITY, SELF-EFFICACY, REACTANCE AND ADS EXPOSURE

Independent variables	SMOKER IDENTITY			SELF-EFFICACY			REACTANCE			ADS EXPOSURE		
	Coef.	*Std. Err.*	*P>t*	*Coef.*	*Std. Err.*	*P>t*	*Coef.*	*Std. Err.*	*P>t*	*Coef.*	*Std. Err.*	*P>t*
Sex: Female	ref			ref								
Male	0.181	0.032	0.000	-0.281	0.034	0.000	-0.177	0.046	0.000	0.014	0.017	0.437
Age group: Adult	ref			ref			ref			ref		
Adolescent	-0.089	0.031	0.005	-0.042	0.038	0.272	0.322	0.065	0.000	0.206	0.023	0.000
Educational level			0.000			0.007			0.038			0.000
Low (some high school and below)	ref			ref			ref			ref		
Moderate (completed high school)	-0.076	0.028	0.007	-0.109	0.033	0.002	-0.156	0.061	0.012	0.180	0.022	0.000
High (some college and above)	-0.268	0.050	0.000	-0.103	0.053	0.058	-0.175	0.099	0.096	0.308	0.035	0.000
Smoking status	n/a			n/a			0.770	0.051	0.000	0.063	0.019	0.000
Smoker identity	n/a			-0.201	0.012	0.000	n/a			n/a		
Self-efficacy	-0.148	0.010	0.000	n/a			n/a			n/a		
Reactance	n/a			n/a			n/a			0.035	0.003	0.000
Advertising exposure	n/a			n/a			0.273	0.025	0.000	n/a		
HSI	0.201	0.007	0.000	-0.130	0.008	0.000	n/a			n/a		
Quit intention	-0.201	0.021	0.000	0.614	0.023	0.000	n/a			n/a		
Cigarette flavor			0.000			0.022						
Clove only	ref			ref			n/a			n/a		
Non-clove only	-0.030	0.024	0.221	-0.005	0.027	0.865	n/a			n/a		
Both	-0.154	0.028	0.000	0.094	0.035	0.007	n/a			n/a		
Cigarette filter			0.001			0.026						
Filtered only	ref			ref			n/a			n/a		
Non-filtered only	-0.143	0.039	0.000	0.023	0.044	0.657	n/a			n/a		
Both	0.004	0.033	0.913	-0.098	0.038	0.009	n/a			n/a		
_cons	3.218	0.047	0.000	3.999	0.053	0.000	2.876	0.105	0.000	2.755	0.029	0.000

APPENDIX G. SAMPLE DIFFERENCES ACROSS HEALTH TOPICS (%)

Variables	Addiction	Death	CVD	Impotence	Lung Disease	Mouth Cancer	SHS	Throat Cancer	p-value
Sex of respondents									0.074
Female	22.5	20.8	18.6	18.3	19.8	21.1	20.8	19.2	
Male	77.5	79.2	81.4	81.7	80.2	78.9	79.2	80.8	
Age group									<0.001
Adult	47.0	48.1	47.4	55.6	51.2	49.7	51.0	46.6	
Adolescent	53.0	51.9	52.6	44.4	48.8	50.3	49.0	53.4	
Smoking status									0.246
Non-smokers	25.8	26.3	26.1	25.4	29.0	27.5	25.4	27.4	
Smokers	74.2	73.7	73.9	74.6	71.0	72.5	74.7	72.6	
Educational level									<0.001
Low (some high school and below)	60.3	62.5	60.5	57.0	56.1	57.2	58.7	60.6	
Moderate (completed high school)	35.0	34.7	35.6	37.9	37.1	40.4	37.4	34.8	
High (some college and above)	4.7	2.8	3.9	5.2	6.8	2.4	3.9	4.7	